APR 6 1925

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Electrical World

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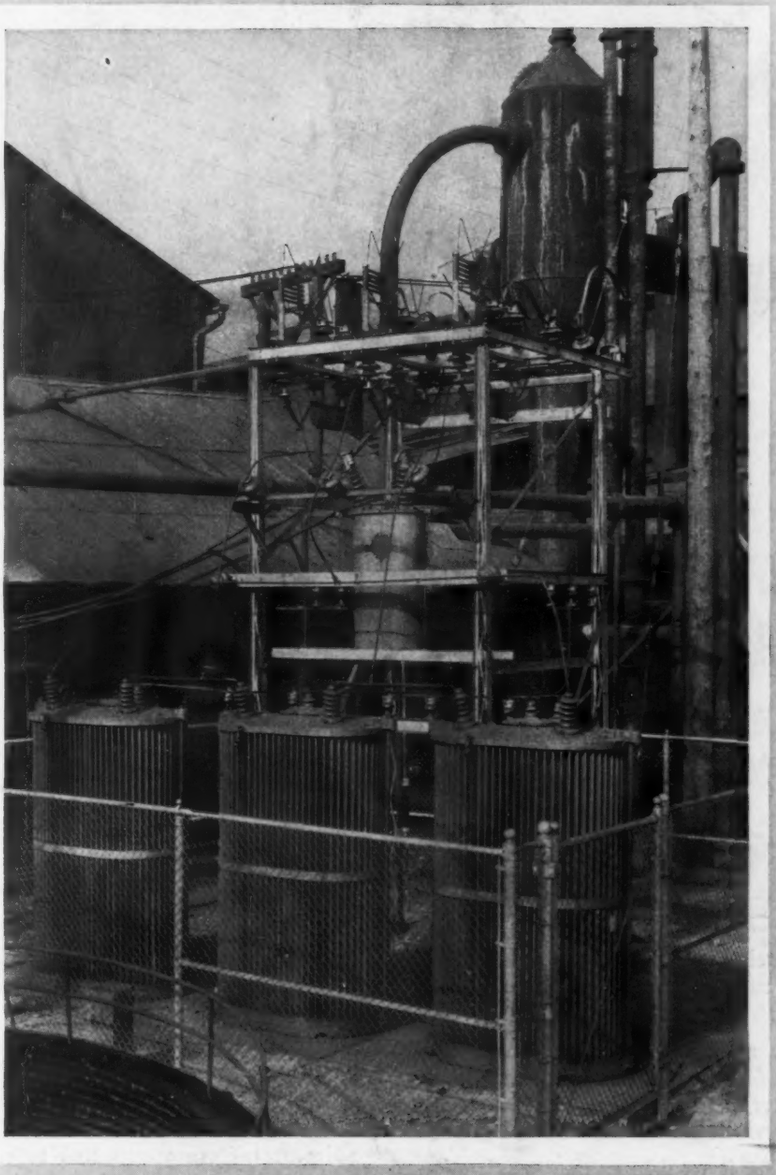

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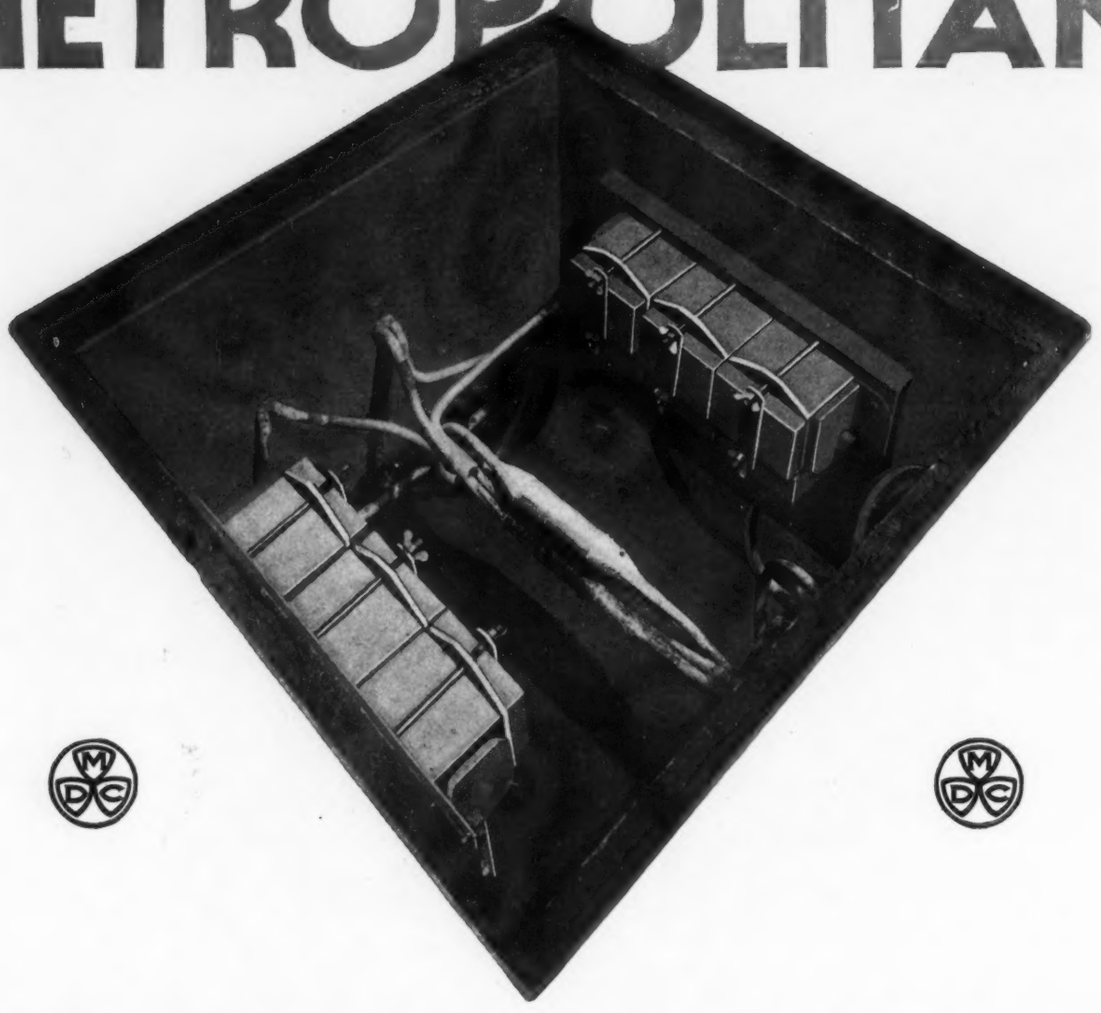

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Electrical World

THE CONSOLIDATION OF ELECTRICAL WORLD, ELECTRICAL ENGINEER AND AMERICAN ELECTRICIAN

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W. H. ONKEN, JR.

Editor

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General Business Outlook and the Electrical Industry

THE year 1924 admittedly broke no records in the business world. It was a presidential year, and like all presidential years it was marked by general inaction and watchful waiting. However, the electrical industry went about its business, buoyantly and agressively, undaunted by conditions in other industries. So far from sharing in depression, reports just issued indicate that the large manufacturers of electrical apparatus once more reaped substantial yearly profits. If a trifle less work in the shape of unfilled orders was carried over last year to 1925 than was carried over a year previously, the sales billed were actually larger than in 1923. Statistics on the electric light and power companies showed record outputs and earnings and larger expenditures for new stations and additions to existing systems.

This year, in spite of declines in general business, the electric light and power companies of the country, on whose continued growth the electrical manufacturing industry largely depends, show larger outputs and almost $200,000,000 more money raised during the first three months of 1925 than during the similar months of 1924. Much of this new money was absorbed in refunding operations, but, as the ELECTRICAL WORLD'S survey has already shown, the construction program of the electric central stations for 1925 is of huge proportions, requiring approximately $600,000,000 for that purpose alone this year. General industry, now that Congress has gone home and many state legislatures are quiescent, should soon show evidences of renewed activity, and with a return of general prosperity the electrical industry is sure to establish greater records than ever.

Tax on Electricity from Canada

ALTHOUGH details are lacking, the proposed tax of three-tenths of a mill per kilowatt-hour on electricity exported from Canada has caused quite a commotion along the Niagara frontier, where most of the exported power is received and used. Canada, however, needs the money and is admittedly within her rights in imposing the tax. If the Canadians will repeal the law limiting all export licenses to one year, they will be doing a service to themselves and us. More hydroelectric developments would be installed in Canada by American capital and more electricity and greater income would be available in the provinces to the north if this law were repealed. Few large industries on this side of the border care to contract for power which may be cut off in a year, and fewer still will locate on the other side of the border for the sake of saving a few dollars in the cost of power.

Labor, transportation and market are of infinitely greater importance to an industry than power—a fact which Canadian legislators and provincial premiers need to take to heart. According to the United States Census of Manufactures for 1919, the last available, the total cost of fuel and power for all reported manufacturing enterprises was only 2.6 per cent of the value of the finished product. The cost of power alone would obviously have been much less. However, in the case of many large electrochemical industries located at Niagara Falls a tax of only three-tenths of a mill per kilowatt-hour might prove a burden, and the sooner greater diversion of water is permitted at the Falls to offset this condition, the better for the electrochemical industry and for the country at large. To handicap the electrochemical industry is to handicap the steel, automobile, soap and numerous other great industries depending on it for important basic materials.

A Missile Sent with a Transparent Motive from a Glass House

ALL is not well in the City of Brotherly Love. One of its outstanding men, whose every utterance breathes of harmony between men and management, has become discordant and irritable. Nay, more, he has become irascible and has even stooped to calumny. Why? Because he seeks revenge, and thereby hangs a tale.

T. E. Mitten for years was a favorite of a certain group of bankers interested in electric railways. They took him from Buffalo, where he was operating the International Railways, and sent him to Chicago to rehabilitate the Chicago City Railway. More recently they placed him in charge of the Philadelphia Rapid Transit Company for the purpose of bringing order out of chaos. And in every case Mitten gave a fair account of his stewardship, although he loaded the systems with Mitten cars most of which had to be rebuilt. Then there came a rift between Mitten and the bankers; hence the present commotion in Philadelphia.

Finding that the same bankers, or rather banker, against whom he is incensed is interested in the Philadelphia Electric Company, Mr. Mitten, himself the purchaser of a large block of power from the company, attacks the latter utility, charging its management with incompetency and asserting that its methods and system lack modernity. In his campaign against the electric utility he betrays a certain ambition, or shall we say covetousness? Without owning the electric company, Mr. Mitten is desirous of controlling it and publicly asks stockholders for proxies. Not that he has shown any particular aptitude in the electric light and power business—his experience has been wholly in the railway business—nor because he is a better builder—Philadelphia Electric stock is many times stronger than Philadelphia Rapid Transit. The electric company, moreover, has cut its rates for service three times within the last three years, whereas the car riders of Philadelphia have had to pay increases during that

time. Now, we hold no brief for bankers in this case, nor are we particularly concerned in Mr. Mitten's controversy with the Philadelphia Electric Company over the Conowingo hydro-electric development on the Susquehanna; but when a man deliberately offers 2 per cent higher dividends as a bait for proxies in an endeavor to get control of one of the country's largest and soundest electric utilities we cannot refrain from commenting on the consummate gall displayed.

It is a serious thing for one public utility operator, and especially a railway operator, to try to undermine the public relations of another utility by aspersions on its management. People who live in glass houses should not throw stones. There is no need of apologizing for wanting the Philadelphia Electric Company —it is a good property with great opportunities. But the honorable way to gain control is to purchase it. Even Mr. Mitten acknowledges it is worth having, and so do others, for the Philadelphia Electric stock has taken quite a jump in the last few weeks. It is a pity, however, that Mr. Mitten vents his spleen in the way he does. While his boldness may be admired by some, it is not in accord with Mr. Mitten's "Golden Rule" as expressed in his letter to the Philadelphia clergy about six months ago. Perhaps the stone he casts at the Philadelphia Electric Company will prove a boomerang. At any rate, his craftiness is likely to be futile, and this is the best thing about the whole attack. Promises even of enhanced dividends do not pass for performance these days. The public—especially the stock-owning public—has acquired wisdom.

Research Methods and Technique

IT IS gratifying to note a new form of activity on the part of the Division of Physical Sciences of the National Research Council, namely, the preparation and issuance of comprehensive reports on laboratory technique. These reports are published under the guidance of the committee on research methods and technique, which consists of prominent investigators connected with various universities and with the Bureau of Standards. It is not the purpose of these publications to present the results of a particular original piece of research or to record the annual progress in this or that field, but to assist investigators in obtaining some general desirable conditions or measurements in their particular undertaking. For example, investigators working in entirely different fields, such as electricity, mineralogy or botany, may desire to find for the first time in their experience the effect of extreme cold on some specimens. These researchers may be prominent workers in their respective fields, but may know very little about how to produce and to measure low temperatures under laboratory conditions. Or, again, they may not know how to keep a very high temperature constant. It is here that the National Research Council has come to their aid by publishing excellent monographs on "The Production of Cold" and on "Thermostats for Very High Temperatures." Both have appeared in the *Journal of the Optical Society of America* (Vol. 9, pages 411 and 599, 1924). It is hoped that financial means and willing workers will be available to cover numerous other fields of general laboratory technique, as well as mathematical methods which are not readily available in books. The investigators themselves could help the committee by suggesting topics and indicating specific difficulties in their own work.

Decorative Lighting Fixtures with Definite Lighting Aims

MANY of our so-called decorative lighting fixtures for homes and for other places having a "home atmosphere" are merely those of the days of candles, electric lamps having been substituted for the flame-light sources. Obviously such fixtures are considered only from the art side, for it is obvious that none of the modern possibilities of light control has been introduced into their design. Modern artificial light is controllable beyond any comparison with the light from flames. This is one of our wonderful heritages from scientific development. The so-called fixture designer who copies ornaments of the past and merely replaces the candles with electric sockets and lamps is not a designer. He is an imitator who creates nothing. He does not utilize the blessings of science and he does not add to the progress of art.

In some places the uncontrolled light from candle fixtures and ball-lamp fixtures produces a satisfactory lighting effect, but in many applications of light the most satisfactory effect is achieved by controlling the light. This need not be done at the expense of the charm of "electric candles," for these may be retained for their decorative effect. A group of them may even help to conceal other lighting equipment which provides direct or indirect lighting. In fact, the decorative light element in fixtures cannot be better attained in general than by using shaded electric candles. The home, ballroom, restaurant, hotel, club and many other places need decorative fixtures which also have definite lighting aims.

An inspection of displays of so-called decorative fixtures with these thoughts in mind will convince any one that they do not represent progress in art or in science. In most of them art has stood still and scientific and artistic possibilities of modern light-control have not even been considered. These are not lighting fixtures worthy of the present time. They are mere imitations with characteristic weakness. The day has arrived for the artist in illumination to step forth and blend science and art in fixtures befitting the potentiality of modern light.

Electricity's Rôle in Rebuilding Storm-Ruined Towns

TORNADOES are a cause of constant destruction in some regions of the United States. One of the worst on record recently played havoc in sections of Illinois and Indiana and to a less degree in Missouri and Kentucky. Thousands of homes were laid low, hundreds of human lives sacrificed and whole communities wiped out. As was natural, a nation shocked by the terrible loss of life and property hastened succor to the injured and the distressed. The electric public utilities in the devastated area made heroic efforts to restore service as promptly as possible, rising to the occasion as repeated experience shows that they may always be trusted to do.

Of course, most of what has been destroyed will be rebuilt. That it ought to be better built goes without saying, and in the planning of new homes and new communities the electrical industry can render inestimable service. There is a silver lining to every cloud, and by the aid of electricity model homes and model towns can spring up to replace those wiped out by the

tornado. The electrical industry must take the initiative, however. It must help plan the installations and aid in the financing of them. When West Frankfort and Murphysboro and Princeton and the other wrecked communities arise from their ruins in the stirring American fashion, the industry should see to it that they are thoroughly electrified towns—models for small cities in their states and in the nation.

Modern Stations to Be Discussed

AT THE St. Louis convention of the American Institute of Electrical Engineers, to be held in the week of April 13, one of the attractive features of the program will be a symposium on the largest power plants used to produce electricity. A formal paper by Prof. C. F. Hirshfeld on Trenton Channel will be presented, and the unusual features of Cahokia, Philo, Weymouth and other large plants will also be described. These stations represent the completed designs of different groups of engineers and serve to give actual experience in the use of installations which differ widely. The discussion should bring out conclusive opinions and facts on many heretofore debatable or unknown elements in station design.

The advantages and disadvantages of pulverized fuel and the layout of preparation plants, the use of the Cottrell precipitator for removing powdered ash from stack gases, the real possibilities of high-pressure boilers, of reheating and of multistage bleeding, the use of single-pass versus multiple-pass condensers, the various auxiliary supply and operating systems and many other similar topics will be discussed in the light of actual experience. Power-station design has moved forward rapidly in the past few years, and it is well to take stock before adopting any of the many new practices now available in the industry. A frank discussion should clarify the situation greatly.

The Electragists Define the Path of Distribution

IT IS interesting to consider the significance of the resolution recently adopted and made public by the executive committee of the Association of Electragists International. It set forth this principle—that distribution in the electrical industry should be from manufacturer through jobber, through contractor and dealer to consumer. In a word the national association of the contractors and dealers of the electrical industry has in effect officially notified electrical manufacturers that, in the judgment of the members of this association, they should not bypass the electrical jobber and sell either to the contractor-dealer or to the consumer direct and that the jobber should not sell to the consumer direct. And at the same time it no less pointedly admonishes the contractor-dealer against bypassing the jobber and purchasing direct from the manufacturer.

The general adoption of this principle would work many changes in the present practices of distribution in the electrical industry, for today the functional line is not sharply drawn at any point. Manufacturers of many lines sell one thing to the wholesaler, another both to jobber and retailer, and another to the consumer—sometimes the same thing to all three classes of "customers." The jobber in many cases sells to the contractor and the dealer and also to the public. The retailer buys with one hand from the wholesaler and with the other from the factory. The distribution policy depends upon the character of the commodity, the nature of the market and the inclination of the man who sells. It is all very confusing and at times very wasteful. It has helped mightily to foster an excessive number of wholesalers and to intensify to a wasteful degree the competitive strife for visible orders by an army of salesmen who tread in one another's footsteps to the common sources of business and neglect greater opportunities to be won through the creative development of new markets.

Of course, the mere enunciation of such a principle will not win men to its adoption, for, no matter how fine it sounds, it will not wean men from conflicting policies that they have long considered expedient. And naturally with any such broad ruling exceptions are inevitable and expected. But it is encouraging to see an organization come out flatly in the definition of such a fundamental belief and declare a policy. The acceptance of this principle by new converts will follow only as the truth of it is demonstrated in economic benefits that reward adherence to this prescribed path in the flow of goods.

Competition for the Amphioxus

WORD came from the good ship *Arcturus* the other day by wireless from the Sargasso Sea, where the American Museum of Natural History's scientific expedition under William Beebe was probing the depths for the secrets of life, that specimens of the amphioxus had been discovered still living in the seaweed. Now, the heyday of the amphioxus, a little worm with a backbone, is set at something like sixty million years ago, and here it is living along, unknown to man, apparently unconscious of the lapse of time and the changes that have come into the world.

By what popular writers might be pardoned for calling "a strange coincidence" there was read the same week before a meeting of the Commercial Section of the National Electric Light Association a letter lately received from a committeeman of one of the geographic sections in which this statement was made: "We cannot get any interest in commercial affairs among central-station men in this section." If this statement were to be taken as literally true, it would seem that the amphioxus made a serious error in judgment in settling so far out in the stormy deep when such a safe and favorable habitat lay so conveniently safe on land.

"No interest in commercial affairs," in sooth! But the very light and power industry is a commercial affair—a business enterprise in which countless men and women have invested their savings in expectation of a fair return of profit. The hiring of the employees to operate a central station is a commercial affair. The sale of energy to the homes and industries of the community is a commercial affair. No! the letter did not mean the thing it said.

The leaders of the great and growing electric power industry are vitally and eagerly interested in commercial affairs today, and so are the men who operate the individual utilities in countless cities. True, some local managers still lack concern for modern methods and policies of market development, but the commercial awakening is sure and fast, and the amphioxus need feel no jealous alarm. The central-station man who has no "interest in commercial affairs" will soon cease to cling to life like the denizen of the Sargasso and be entirely extinct like the dodo.

Southern Fugitive Waters Require Steam Reserves

WATER-POWER developments in the South have made possible an industrial growth which has been remarkable. With the great increase in central-station load and because of the stream-flow type of development of water power, it became necessary to install steam reserve stations to augment the hydro-electric plants.

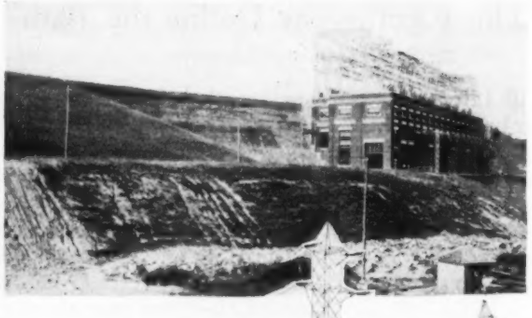
These stations are little used and have been designed to give maximum output for each dollar invested. In many cases complicated bus and switch-house structures are omitted and the energy from each unit is supplied directly through transformers to outdoor step-up substations.

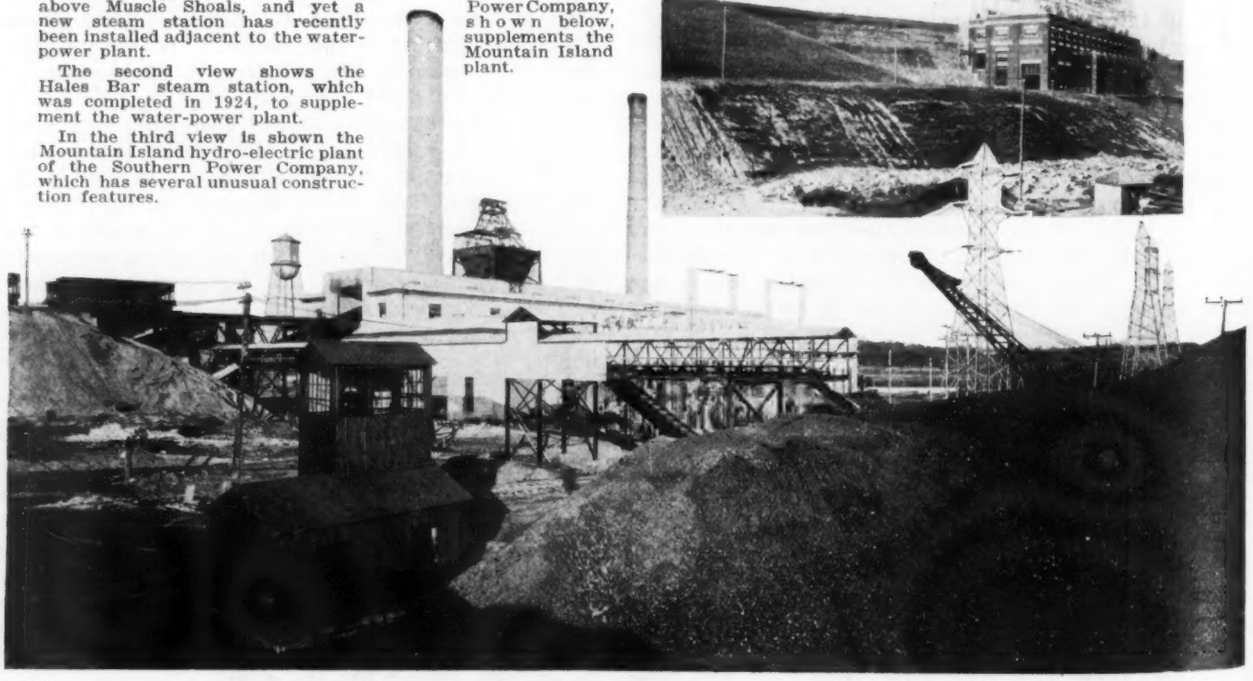
The Hales Bar plant of the Tennessee Electric Power Company, shown at top, is about 60 miles above Muscle Shoals, and yet a new steam station has recently been installed adjacent to the water-power plant.

The second view shows the Hales Bar steam station, which was completed in 1924, to supplement the water-power plant.

In the third view is shown the Mountain Island hydro-electric plant of the Southern Power Company, which has several unusual construction features.

The Mount Holly steam plant of the Southern Power Company, shown below, supplements the Mountain Island plant.





Dual-Frequency Supercalender Drive

Physical Exertion on Operators, Personal Hazards, Fire Risks and Lighting Costs Reduced —Production, Speed of Calenders and Cleanliness Increased—Less Floor Space Needed and Noise Reduced 90 per Cent

By W. H. SCOTT
Chief Engineer Kalamazoo Paper Company, Kalamazoo, Mich.

NINE supercalenders at the plant of the Kalamazoo Paper Company, Kalamazoo, Mich., have been equipped with the dual-frequency drive, which has been developed recently, to eliminate the disadvantages experienced with the original steam-engine drives. Formerly the calenders were driven from long line shafts to which they were belted. The belts, together with the gearing and the mechanism required for starting the calenders, were exceedingly noisy, very dirty and greasy and a pronounced fire hazard. Because of the numerous belts required a considerable portion of the natural lighting of the calender room was shut off, making it necessary to resort to artificial illumination. The continuous shifting of clutches required with the old drive tired the operators physically so that during the latter part of the day production often diminished noticeably. Besides, the old drive required considerable space, and its control, because it was mechanical, was limited to positions which could not assure the lowest personal hazard.

On account of the foregoing objections it was decided to discard the old drive and select something which would more nearly approach the modern ideals of operation in a paper mill. In a few words, these requirements might be summarized as greater production and flexibility, decreased over-all expense and reduced personal hazard and fire risk. Up to the time of the development of the dual-frequency drive virtually only two methods of drives were available—the single-motor and two-motor equipments. With the first method threading-in and running speed is obtained by means of suitable gear reduction and clutches. With the two-motor drive the running speed is obtained by operating the larger of the two motors through a spur-gear reduction, whereas the threading-in speed is obtained with the small motor by means of an additional gear reduction and an overrunning clutch. Normally the threading-in speed is about one-tenth of the full running speed, and it is sometimes desirable to have intermediate speeds so that the calender can be slowed down for bad or weak spots in the paper. Both of these drives had the objections that they required gear reductions, and one of them had the disadvantage of requiring a separate motor and an overrunning clutch.

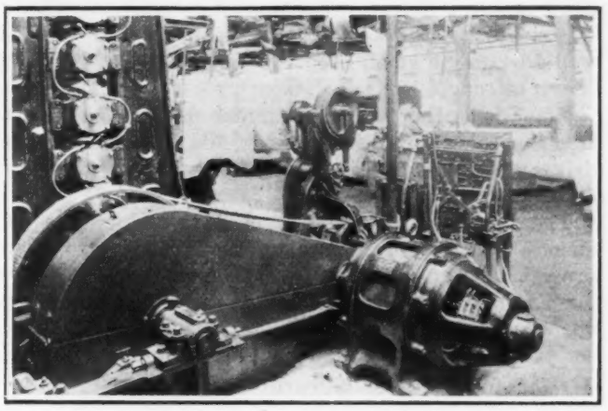


FIG. 2—SMALL SPACE IS OCCUPIED BY THE MOTOR AND INCLOSED SILENT CHAIN DRIVE TO THE CALENDER STACK

In looking around for an electric drive which would not have these disadvantages or the disadvantages of

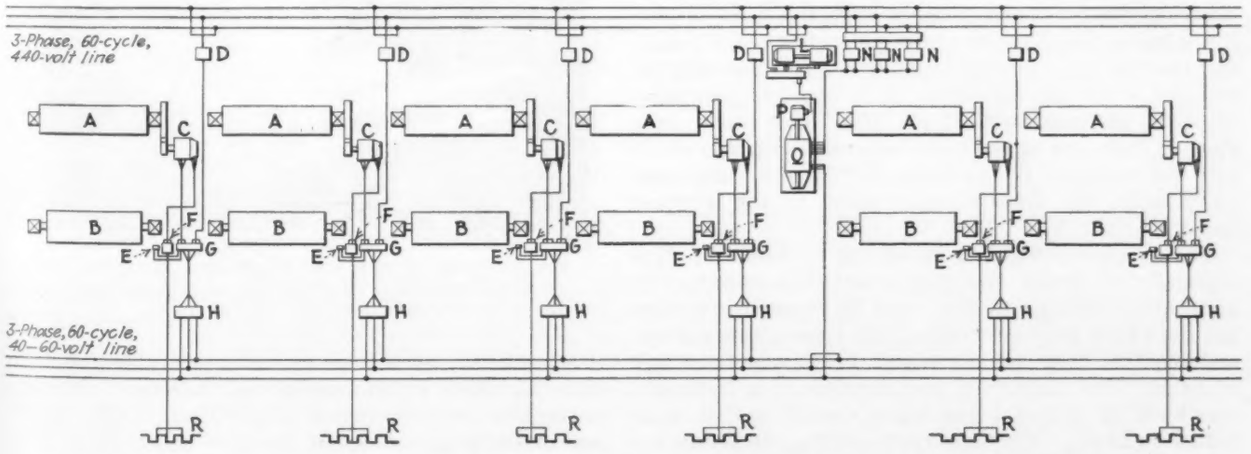


FIG. 1—LAYOUT AND CONNECTIONS OF DUAL-FREQUENCY SUPERCALENDER DRIVE AT PLANT OF KALAMAZOO PAPER COMPANY

A—Calender.
B—Reel.
C—Calender motor.
D—Westinghouse Krantz safety switch.
E—Stop button.
F—Controller.
G—Calender motor panel.
H—Westinghouse Krantz safety switch.
K—Panel for control of M. G. set and frequency changer motor.
L—Motor-generator set.
M—Circuit breaker.
N—Single-phase transformer 440-60, 40 volts.
P—Frequency changer motor.
Q—Frequency changer.
R—Resistance grids for secondary of calender motor. May be mounted in basement or near ceiling or in any other place where they will be out of the way of the employees and production operations.

the old steam drive attention became centered on the dual-frequency drive developed by the Westinghouse Electric & Manufacturing Company. On the face of it this drive seemed most desirable because it involved only one motor through a single gear or chain reduction attached to the lower calender roll. Furthermore, the speed can be adjusted from normal to 10 per cent of its value, very little space is required, and push-button control with its flexibility of location (common to all electric drives) is obtainable. Though a special frequency changer was required in conjunction with the drive to obtain the required speed adjustment, the investment required therefore became less significant when it was realized that the amount chargeable to each calender would be only a small proportion of what it would be if fewer calenders were driven.

After balancing the total annual charges against the advantages and disadvantages of the different types of drives available, it was decided to install the dual-frequency drive.

The frequency changer is used to reduce the frequency to about 10 per cent of its normal value. This provision, coupled with an auto-transformer for reducing the voltage from 440 to 75, made it possible to operate the motor driving the calender so that it will rotate at approximately 10 per cent normal speed, which is the desired threading-in speed of the calender. The motor is of the wound-rotor type and is designed to have a high starting torque at the low frequency. Thus it will be able to start the supercalender stack under the most extreme load conditions. On the first step of the controller the motor is connected to the low-frequency source with all secondary resistance in. The second step disconnects the motor from the low-frequency source and connects it to the high-frequency source, at the same time inserting resistance into the rotor circuit. Subsequent steps of the controller serve to cut out the secondary resistance in the rotor circuit until full speed is obtained. The secondary resistance is so designed and adjusted as to give smooth acceleration from threading-in to production speeds, thus avoiding paper breakage. "Stop" push-buttons at various points around the calender enable any attendant to stop operation without having to touch the controller. This feature, which may be considered an advantage of all electrical drives, is particularly attractive here in that it minimizes the clogging of the rolls when paper breaks and thereby reduces delays which cut down production and also minimizes the hazard to human life. In order to start the calenders again after they have been stopped from one of the push-buttons, it is necessary to turn the controller handle to the "off" position and come up through the low-frequency point to the running speed.

The frequency changer is of the commutator type especially designed for frequency conversion. The armature is similar to that used in rotary converters, but the brush gear is arranged for three-phase current and requires three equally spaced brush arms per pair of poles. The stationary part consists of a laminated core built up in a cast-iron frame similar to that of an induction motor. Excellent commutating conditions are obtained over its entire load range owing to the rotary-converter action and special design features.

In changing the frequency the action of the machine is somewhat similar to that of the rotary converter, but instead of operating at a single speed and producing direct current, it is operated at speeds a few per cent below or above regular speed and, therefore, delivers a current having a frequency proportional to the percentage of the armature speed above or below the nominal speed. Although the frequency changer may be designed to operate at the required speed without the use of a driving motor, a small direct-current motor of sufficient size to overcome the mechanical friction of the set is employed to drive the frequency changer in

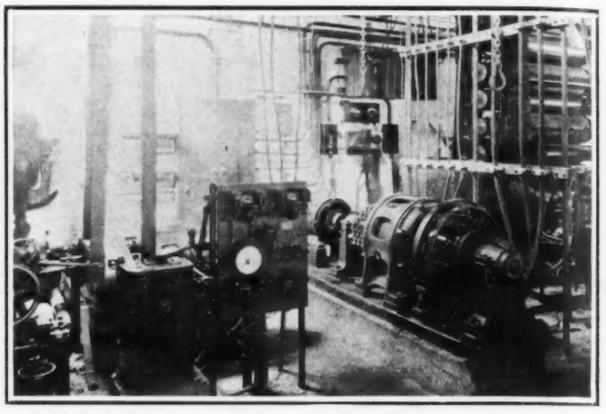


FIG. 3—FREQUENCY CHANGER WITH SUFFICIENT CAPACITY FOR OPERATING NINE CALENDER STACKS AT THREADING-IN SPEED

Transformers and drum controller with contactors for one calender are shown.

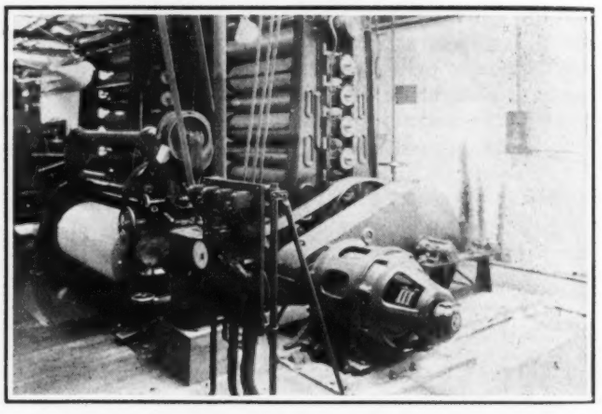


FIG. 4—CONTACTOR PANEL, CONTROLLER AND STOP PUSH-BUTTONS FOR ONE CALENDER STACK

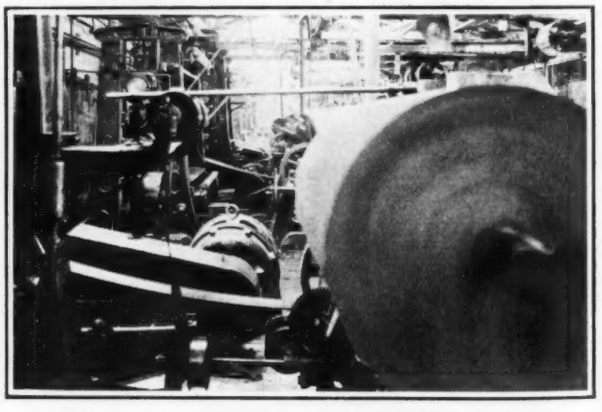


FIG. 5—SEVEN OF THE NINE CALENDERS DRIVEN BY THE DUAL-FREQUENCY SYSTEM, SHOWING LEATHER-LINK BELTS DRIVING REELS

this plant. The load on the small driving motor is not affected by the load on the frequency changer.

According to the manufacturer, the commutator type of frequency changer is employed, instead of the induction type, since the former is much smaller and has a much higher efficiency and better voltage regulation. An induction-type frequency changer would be about twenty times as large as the commutator type and would have losses five or ten times greater. For these reasons the commutator type was used.

The layout and electrical connections of the dual-frequency supercalender drive are shown in the accompanying schematic wiring diagram. It will be noted that the control wiring is extremely simple and that each supercalender operates entirely independent of the other. The capacity of the frequency changer is such that all of the supercalenders can operate at the threading-in speed at the same time. A 10-kw. motor-generator set supplies the direct current for operating the motor driving the frequency changer. In a mill having direct current available this set would not be required, nor would it be where an alternating-current motor is used.

Since the dual-frequency drive has been installed very satisfactory performance and marked economies in operation have been obtained. Production has been increased 25 per cent, owing to reduced physical exertion on the operators and the increased average speed of the calenders. Speed and flexibility of operation have been greatly increased, and personal hazard and fire risk have been reduced. Some of the space which had been formerly occupied by the old steam drive has been released for other purposes, noise of belts and gears has been reduced, the amount of oil necessary has been reduced, and cleanliness has been increased. By elimination of the overhead belting natural lighting has not been interfered with, and artificial lighting is thereby reduced. In general, this installation has produced results that are gratifying and much appreciated by the management.

Efficient Handling of Meter Orders

Method Described by Which the Southwestern Gas & Electric Company of Shreveport, La., Reduces the Time Necessary to Give Adequate and Quick Service to Its New Customers

By R. E. NAYLOR
New-Business Manager Southwestern Gas & Electric Company, Shreveport, La.

RED tape and delay react unfavorably on any person who is transacting business, and this is particularly true when a would-be customer approaches a light and power company to apply for service. Study and analysis have shown that irritation is caused by difficulty in finding the place at which to apply for service or order the transfer or removal thereof, by filling in blanks, by being shifted from one clerk to another (sometimes at widely separated points), by waiting for the company to investigate its records to ascertain when and whether service can be installed and by difficulty in getting a definite promise when the work will be done and having it completed when promised. Connection charges and cash deposits to insure payment of bills, if not properly handled, also cause irritation.

Name J. H. Thomas Deposit Deposit

	NO.	STREET	CLASS OF ACCOUNT	ORDERED ON	ORDERED OFF	REMARKS	NEW?
(a)	1421	Herndon Ave	P	10/5/22	7/12/24		
(b)	246	Youree Drive	G	7/12/24			X
(c)							
(d)							

APPLICATION FOR ELECTRIC SERVICE

I hereby request the SOUTHWESTERN GAS & ELECTRIC COMPANY to supply electric service to the above premises. In consideration of service furnished as above, I agree to observe the stipulations printed on the reverse hereof.

	(DATE)	(SIGNATURE OF APPLICANT)	(MAILING ADDRESS)	(PHONE)
(a)	10/5/22	J. H. Thomas	same	4289
(b)	7/12/24	J. H. Thomas	P.O. Box #413	635
(c)				
(d)				

FORM 37 12M-6-24

FIG. 1—BLANK USED FOR APPLICATION OF SERVICE

Recognizing these possible sources of annoyance and being convinced that the first step toward good public relation is to leave a good first impression, the Southwestern Gas & Electric Company has established a routine for handling applications for service, transfers and discontinuance thereof, which, it is believed, eliminates most of the foregoing irritants and at the same time permits the company to keep all the records that are desired and handle its business in the most efficient manner possible.

The first requisite—namely, making the application clerk readily accessible to the public—was provided by careful arrangement of the offices on the ground floor of the company's headquarters. The application desk of the new-business department, which is an open counter long enough to accommodate ten or twelve persons at one time, is in full view of the street entrance, is plainly and conspicuously labeled and is always attended by the commercial manager, an assistant and a young woman. Directly opposite this desk are two windows for the receipt of money, two windows being provided so that no one need stand long in line. Between the cashier's windows and the new-business department

REQUEST FOR REMOVE ORDER

Name J. H. Thomas Date 7-12-24

Address 1421 Herndon Date to Be Executed ✓

Class of Account: Meter Order No.

Deposit ____ Account No. ____

Guaranteed ____ ✓ Gas Meter No. ____

Credit ✓ ✓ Electric Meter No. ____

Mail Final Bill to 246 Youree Drive — P. O. Box #413

or Will Call ____

Deposit Card Pulled	FINAL READING	FINAL BILL
	Gas ____ 192__ Index ____	Mailed ____
Form 77	Electric ____ 192__ Index ____	Held ____

Remarks: ____

CERTIFICATE OF GUARANTOR

Shreveport, La. July 12 1924

I HEREBY CERTIFY that I have requested the SOUTHWESTERN GAS & ELECTRIC COMPANY to supply GAS and ELECTRIC service to 246 Youree Drive Street.

SIGNATURE OF APPLICANT J. H. Thomas

I certify that I am the owner of the property to be supplied under the agreement referred to above, and I hereby agree to pay all bills justly rendered in accordance with said agreement and not otherwise paid.

SIGNATURE OF GUARANTOR F. L. Gibson

Address #1613 Slattery Bldg.

FORM 89 10-6-24

FIG. 2 (LEFT)—REQUEST FOR DISCONNECTION OF SERVICE; FIG. 3 (RIGHT)—CERTIFICATE OF GUARANTOR

FIGS. 4 AND 5—MAIN FLOOR OF SOUTHWESTERN GAS & ELECTRIC COMPANY'S MAIN OFFICE, SHOWING APPLICATION DESK AND CASHIER'S WINDOW

1 METER ORDER--ELECTRIC SERVICE DEPT. Nº 5423 E

NAME ____ CLASS ____ DATE ____

ADDRESS ____ DEPOSIT GUARANTEED CREDIT D G C ____ PHONE ____

ORDER TO ____ METER ON (IF FUTURE DATE) ____ NEW JOB? ____ INSP. IN? ____

BILLS TO ____ CONST. REQ'D? ____ ORDERED ____

METER REPORT | CONSTRUCTION REPORT W. O. No E ____

Report No.	Date	Completed	On Wagon	HELD: No Temp.	HELD: Not Read	HELD: Const.	REMARKS	REPORTED TO CORP.: Date	REPORTED TO CORP.: By	Work Begun	Est. Date of Completion	Completed	REMARKS

2 METER ORDER--ELECTRIC STATUS REPORT Nº 5423 E

NAME ____ CLASS ____ DATE ____

ADDRESS ____ DEPOSIT GUARANTEED CREDIT D G C ____ PHONE ____

ORDER TO ____ METER ON (IF FUTURE DATE) ____ NEW JOB? ____ INSP. IN? ____

BILLS TO ____ CONST. REQ'D? ____ ORDERED ____

METER REPORT | CONSTRUCTION REPORT W. O. No E ____

Report No.	Date	Completed	On Wagon	HELD: No Temp.	HELD: Not Read	HELD: Const.	REMARKS	REPORTED TO CORP.: Date	REPORTED TO CORP.: By	Work Begun	Est. Date of Completion	Completed	REMARKS

3 METER ORDER--ELECTRIC SHOP TICKET Nº 5423 E

NAME ____ CLASS ____ DATE ____

ADDRESS ____ DEPOSIT GUARANTEED CREDIT D G C ____ PHONE ____

ORDER TO ____ METER ON (IF FUTURE DATE) ____ NEW JOB? ____ INSP. IN? ____

BILLS TO ____ CONST. REQ'D? ____ ORDERED ____

SET	METER	REMOVE
	MANUFACTURER	
	MANUFACTURER'S NO.	
	COMPANY NO.	
	SIZE	
	CONSTANT	
	INDEX	

CONNECTED LOAD: ____ WATTS LIGHTING; ____ WATTS SIGNS; ____ MERCHANT'S LTG; ____ H. P. MOTORS

METER CARD | SHOP BOOK

DATE COMPLETED ____ 19__

BY ____

SHOP CLERK ____

ROUTE OF TICKET 3: NEW BUSINESS DEPT.—METER SHOP.

4 METER ORDER--ELECTRIC WORK TICKET Nº 5423 E

NAME ____ CLASS ____ DATE ____

ADDRESS ____ DEPOSIT GUARANTEED CREDIT D G C ____ PHONE ____

ORDER TO ____ METER ON (IF FUTURE DATE) ____ NEW JOB? ____ INSP. IN? ____

BILLS TO ____ CONST. REQ'D? ____ ORDERED ____

SET	METER	REMOVE
	MANUFACTURER	
	MANUFACTURER'S NO.	
	COMPANY NO.	
	SIZE	
	CONSTANT	
	INDEX	

HOUSE NO. AND STREET VERIFIED O.K. ____

CONNECTED LOAD: ____ WATTS LIGHTING; ____ WATTS, SIGNS; ____ MERCHANT'S LTG.; ____ H. P. MOTORS

ROUTE No. ____

METER RECORD	METER CARD	ROUTE BOOK	ADDRESSOGRAPH	CUSTOMERS INDEX	SHOP CLERK

LOCATION OF METER SET ____

DATE COMPLETED ____ 19__

BY ____

ROUTE OF TICKET 4: NEW BUSINESS DEPT.—METER SHOP—ACCOUNTING DEPT.

FIG. 6—BLANKS MADE OUT IN QUADRUPLICATE FOR ISSUING TO SERVICE, METER AND CONSTRUCTION DEPARTMENTS
(Note that the route of each ticket is indicated on the bottom)

is the service department, which handles all the inquiries and complaints that are received.

One card form (Fig. 1) is required for application for service or transfer thereof and another (Fig. 2) for removal of service. In addition to these forms, only four others (Fig. 6), differing in some details but filled out in quadruplicate, are required so far as the application is concerned. These serve all the requirements of the new-business department, service department, accounting department and the meter shop.

To enable the application clerks to obtain readily all the information necessary to serving the customer, to avoid the necessity of shifting the applicant from one department to another before the transaction is completed, and to expedite the transportation of application data between the various departments involved, a pneumatic carrier is installed between the application desk and the other departments, thereby dispensing with the delays incident to messenger service. To facilitate telling applicants whether service can be installed and the average time required, the application desk is also provided with blue-print plats of the distribution system, made up in small sections and kept up to date by the engineering department, to indicate whether the customers can be served without extending lines.

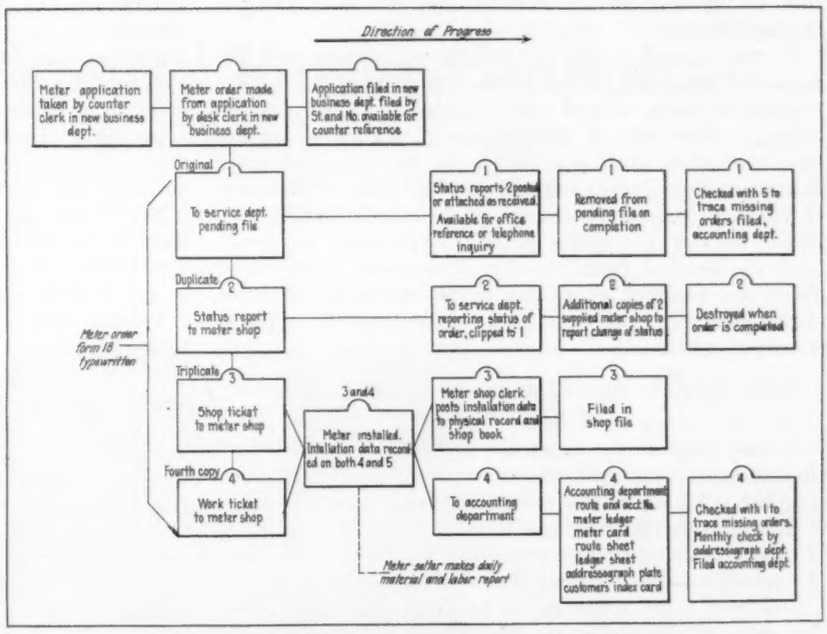

Direction of Progress
Meter application taken by counter clerk in new business dept.
Meter order made from application by desk clerk in new business dept.
Application filed in new business dept. filed by St. and No. available for counter reference
Original
To service dept. pending file
Status reports 2 posted or attached as received. Available for office reference or telephone inquiry
Removed from pending file on completion
Checked with 5 to trace missing orders filed, accounting dept.
Duplicate
Status report to meter shop
To service dept. reporting status of order, clipped to 1
Additional copies of 2 supplied meter shop to report change of status
Destroyed when order is completed
Meter order form 18 typewritten
Triplicate
Shop ticket to meter shop
3 and 4
Meter installed. Installation data recorded on both 4 and 5
Meter shop clerk posts installation data to physical record and shop book
Filed in shop file
Fourth copy
Work ticket to meter shop
To accounting department
Accounting department routs and accts. No. meter ledger meter card route sheet ledger sheet addressograph plate customers index card
Checked with 1 to trace missing orders. Monthly check by addressograph dept. Filed accounting dept.
Meter setter makes daily material and labor report

FIG. 7—ROUTE TAKEN BY METER APPLICATION ORDERS

When a customer applies for service, transfer thereof or removal, the application clerk fills in the card for the applicant, requiring him to sign only the application for service or transfer. After this information has been recorded the cards are sent through the pneumatic carrier to the accounting department. In the case of applications for service this is done to ascertain whether the customer has had any previous relations with the company and if so what they have been. The rules and regulations applying to applications of service are printed on the back of the application blank, and are given here. Attention is called particularly to items 1, 2, 4, 6 and 8.

Only in an unusual case is the customer required to wait while the accounting department checks his record. The information usually needed is available in the new-business department.

As soon as the meter orders called for by an application are typewritten, the application is filed by street and number directly behind the counter of the new-business department. Thereafter it is immediately available for reference as to whether service has been or is being supplied at any particular address, in whose name the account stands, whether it is a deposit, guaranteed or credit account. In the case of request for removal, the card gives accurate information for filling out the order. On transfers it shows when the present account was opened, so that service charge

Rules and Regulations Affecting Applications for Service and Transfer

1. This company will furnish and set a meter for each customer free of charge once in every twelve months, provided, however, that the company has a suitable line in the street or alley on which applicant's premises front. All material furnished remains the property of the company.

2. All wiring and appliances of consumer must conform to city ordinance and Louisiana Fire Prevention Bureau regulations and inspection certificate furnished the company. No person except the company's representative will be permitted to turn on or off the current.

3. The quantity of electric current delivered is to be determined by meter. Should the meter be found defective or cease to register, until it be repaired or replaced the quantity shall be ascertained by the average of another meter or by the amount delivered during a previous corresponding period.

4. If on account of non-payment of bills or violation of these rules and regulations the company is obliged to cut off the electric current, then a charge of $1 will be made for turning same on again, and a like charge will be made each customer requiring the setting of a meter or the transferring of an account from one address to another oftener than once in every twelve months.

5. This company shall not be liable for damages caused by its failure to deliver electric current, whether such failure results from natural or other causes, nor will it be liable for injury to person or property resulting from the use of electricity in any manner.

6. This company reserves the right to cut off the electric current for any of the following reasons: (1) Repairs; (2) violation of these regulations or the application; (3) fraudulent misrepresentation of the use of electric current; (4) non-payment of the bills within twenty days after date of bill.

7. This company's authorized representative shall have at all reasonable times free access to the premises on which the electric current is used in order to read meters and make inspection from time to time.

8. A cash deposit or approved security from the owner of the property will be required of all consumers as follows: (1) All those who do not own the premises to be supplied; (2) all those who have defaulted in payment to or who are indebted to the company, or have been or are members of any defaulting firm or partnership. A cash deposit will be required of all consumers failing to pay their bills in any one month. The cash deposit or approved security is to be based on maximum bill for sixty days' consumption. Deposits and securities are held by this company during the period of this contract.

9. All bills are rendered at the gross rate, and the difference between the gross rate and the net rate specified constitutes a discount for payment within ten days from date of monthly billing. Bills must be paid either at the company's office during office hours on or before the last day of the discount period, or by check through the mail showing postmark on or before the last day of discount period, in order for the consumer to be entitled to the discount. Failure to receive bill does not entitle consumer to discount.

10. The consumer will, without cost to the company, secure in the name of the company all rights-of-way, permits and privileges necessary for the performance of this agreement.

11. These rules and regulations are subject to change to conform with the regulations of the Louisiana Public Service Commission and governmental ordinances of the city of Shreveport or other towns in which service is rendered.

may be made if twelve months have not elapsed since the last change.

If the request is for a transfer of service and the applicant has been served at his last address for twelve months or more, he will not be required to pay for the change. However, if the change is requested within twelve months, or if service has to be furnished after discontinuance due to non-payment of bills or violation of rules, a connection charge of $1 will be made. To obtain service for newly wired installations, a permit must be secured from the city inspection department. These are received every day by the meter department of the utility company and kept on file awaiting applications for service.

CASH DEPOSITS ARE REQUIRED OF CERTAIN CLASSES OF CUSTOMERS

A cash deposit or approved security is required of all customers, (1) who do not own the premises to be supplied, (2) who have defaulted in payments or are indebted to the company or have been or are members of any defaulting firm, corporation or partnership, and (3) who have failed to pay their bills in any one month.

Five per cent interest is paid on these deposits, the amount of which is determined by the size of the customer's load and the probable monthly energy consumption. This charge is $5 for a residence and approximately the amount of a two months' bill for other premises. General information regarding wired houses which have been connected to the utility's distribution system, ownership of homes, frequency of changing services and financial standing of customers is kept by the record department, and this indicates on the application card when it is returned to the application desk whether connection charges or cash deposits are required. Money is received and receipts are given by the application clerk, who "checks up" with cashier at end of day.

Where an inspection permit has been issued on an installation and where the company's distribution lines run past the applicant's house, the company makes it a practice to have any service applied for before 11 o'clock in the morning completed by 4 o'clock in the afternoon and any application received between 4 and closing time will be executed by 2 o'clock the following day. The time required for making service where distribution lines do not pass the house depends on conditions which are explained to the applicant while at the desk by showing him the plan of the distribution system and its relation to his home.

QUADRUPLICATE METER ORDERS GIVE COMPLETE INFORMATION TO ALL DEPARTMENTS

As soon as the application has been completed and the applicant has paid the connection charge or deposit, if one is required, meter orders Nos. 1, 2, 3 and 4 (shown in Fig. 6) are filled out in quadruplicate on a typewriter at the application desk, showing the name of the applicant, the class of service, the date, his address, whether a deposit, guarantee or credit has been issued, the applicant's telephone number, the order to connect, remove or change service, the time when it is desired to complete the work, whether the installation is a new job or not, whether the inspection certificate has been received, the address to which bills are to be mailed, construction required as indicated by the plat book of the distribution system, and the time the work is ordered.

One copy of this form is transferred to the service department by pneumatic carrier as a record on which the clerk can indicate the progress made in installing the meters and completing new construction. This clerk, who keeps in touch with the meter and construction departments, is therefore in a position to keep the work from lagging unnecessarily and also to advise the applicant of conditions if the work has to be dalayed. After the service has been connected, the service department transfers this record to the accounting department for billing purposes, this department being adjacent to the record department.

Blanks Nos. 2, 3, and 4 of Fig. 6, designated as "status report," "shop ticket" and "work ticket," are transferred from the new-business department to the meter shop. Blank No. 2, the status report, is filled in by the meter shop, which also has charge of installing customer's service. On this blank the meter shop reports back to the service department regarding the status of the work. It will be noted that this blank is the same as that transferred to the service department and provides space for information which the service department requires regarding the progress of the work. If more than one report must be rendered by the meter and construction department, this department has report blanks of the same character to which the same number can be given to avoid confusion. The first report is made within half a day after receiving the application.

Blank No. 3—the shop ticket—is kept on file in the meter department as a check on the work ticket, No. 4, which is taken out on the job for filling in the information indicated. When this work is completed, the work ticket, No. 4, is transferred to the accounting department to be used in conjunction with meter order No. 1 for billing and record purposes.

Electrical Progress in Spain

OWING to questions of finance, electrical development in Spain during 1924 was limited largely to the completion of work already under way. Eduardo Gallego, in an article in a recent issue of *La Energia Electrica*, describes the leading projects completed and continued during the year.

The electrification of the "Pajares Ramp" of the Madrid-Gijon railway, with a grade of 22 deg., was completed successfully, and forty-four trains of an average weight of 330 tons pulled by 270-hp. locomotives are being run daily. Energy is stepped down and converted from 30,000 volts alternating current to 3,000 volts direct current and serves to operate the trains ascending the grade at 22 miles per hour and descending at 35 miles per hour. During the year important parts of underground railways in Madrid and Barcelona were completed, and progress was made on Trans-Pyrenean and other electric railway systems throughout the country.

No new hydro-electric plants of any importance were placed in operation, but work already under way on plants and extensions totaling approximately 47,000 hp. progressed rapidly. There is apparent in Spain an increasing tendency to install reserve steam or Diesel-engine stations in connection with existing hydro-electric systems. Diesel stations totaling 9,000 hp. were installed in this way during the last year in all parts of the country.

Measuring Water Flow in Conduits

Multiple Pitot and Piezometer Tubes Used — Applies Old Principle Combining Simplicity, Speed and Accuracy — Photographic Readings

By D. W. PROEBSTEL
Electrical Engineer Portland (Ore.) Electric Power Company

A GREAT deal of experimentation and research has been carried on by many persons with the hope of working out a reliable, convenient and inexpensive method of measuring the flow of water through closed conduits. The development of the hydraulic turbine and its use in the generation of hydro-electric energy are the things which have prompted, to a large degree, the extensive investigations along this line. The hope or motive that has led others to develop new methods inspired the writer to attempt to develop a new and unique application of an old and well-known method. The idea was first conceived in March, 1924, and first used in testing a turbine at the Bull Run plant of the Portland Electric Power Company, Portland, Ore., on May 24 of the same year.

FIG. 1—MANOMETER BOARD MOUNTED ON 9-FT. PIPE LINE
At Oak Grove plant of Portland Electric Power Company

This new method, which will be known as the "multiple Pitot and piezometer tube method for measuring the flow of water through closed conduits," is a form of the old Pitot tube method, but differs from it in that many fixed nozzles are used instead of one or two movable nozzles. A typical arrangement of the equipment is shown in Fig. 3. The Pitot tube nozzles are held in place by means of a cross-frame placed normal to the axis of the conduit. They are so installed that each one is at the center of equal-area segments of concentric rings. Each segment is one-fourth of one of the concentric bands or rings. The center section is an exception, however, it being equal to only two segments and served by one Pitot nozzle. The reading from this center nozzle is used twice, once in each half of the flow curve.

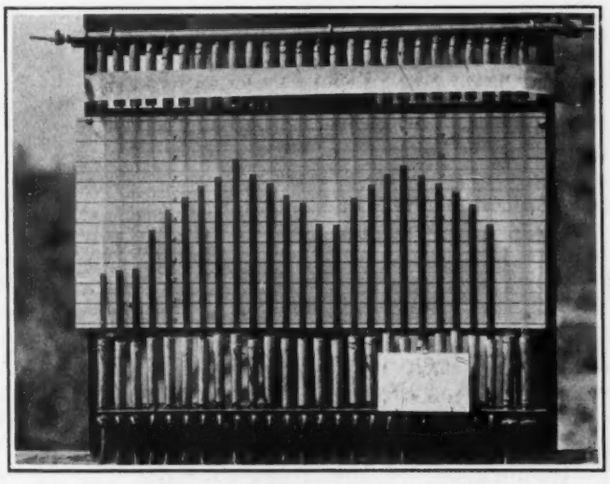


FIG. 2—PHOTOGRAPHIC READING OF MANOMETER BOARD
Showing the three piezometer tubes to the left and twenty-one Pitot tubes to the right.

These nozzles and the piezometer taps are connected to a glass-tube manometer by means of small copper pipes. The glass tubes terminate in a pipe manifold at the top which is arranged so that compressed air can be used to force the water columns in the tubes down to where they can be read on a gage board.

The gage board consists of a white chart carefully lined into tenths and hundredths of a foot. It is placed back of the glass tubes and adjusted so that the lines are accurately horizontal. This is of great importance, inasmuch as the velocity heads in feet are read directly from the chart. The columns of water in the glass tubes are made more visible by using water colored with red or blue pigment. The colored water is forced into the manifold before the compressed air is applied. The air valve and pet cocks shown on the manometer are necessary in making these adjustments.

The camera forms a very important part of the equipment. The old Pitot tube method has fallen into disrepute because of the awkwardness and inconvenience inherent in its application. Much time is required to force the sliding Pitot tubes from one position to another in order to obtain a complete set of readings. During this time conditions of load may change, which would cause errors in the results obtained. Personal errors, such as incorrect readings and wrong notations, are also very apt to occur. With the use of the camera, however, an instantaneous reading can be taken of the pressure head and the combined pressure and velocity heads of an entire cross-sectional area of the conduit. A manometer

board mounted on the 9-ft. diameter conduit of the Oak Grove plant of the Portland Electric Power Company is shown in Fig. 1. The second view (Fig. 2) is an actual reading showing the velocity heads at the center of the area segments described above. The velocity head is the difference between the reading of a Pitot tube and the average of the readings of the piezometer tubes.

METHOD OF CALCULATION

The curve of Fig. 4, and the table, indicate all the work that is necessary to determine the flow of water in second-feet. The velocity (V) in feet per second is calculated from the formula $V = (2gh)^{\frac{1}{2}}$, where h is the

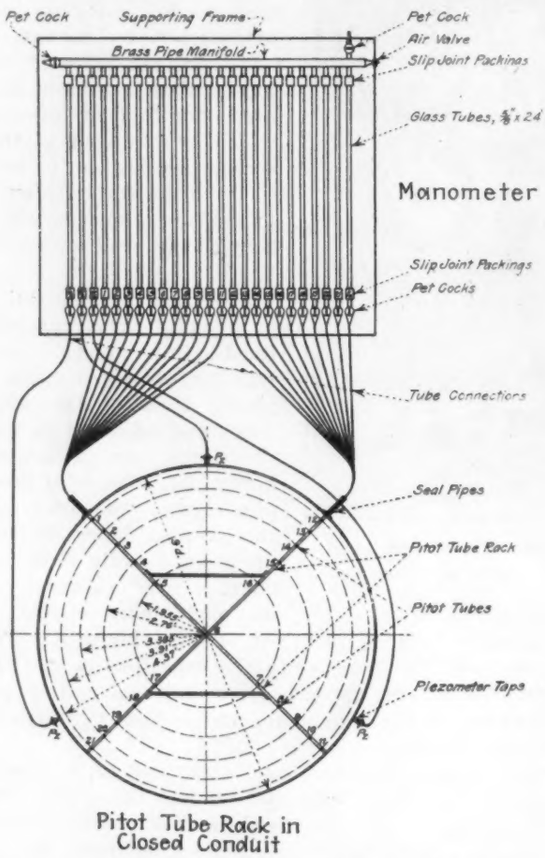


FIG. 3—ARRANGEMENT OF PITOT-TUBE RACK IN CONDUIT AND MANOMETER

For multiple Pitot and piezometer tube method of measuring flow of liquids in closed conduits

velocity head in feet and g the acceleration due to gravity. The velocity values are plotted as ordinates with their corresponding cross-sectional areas as abscissas. The curve which results is called a flow curve. Its area is proportional to the flow of water through the conduit.

Consideration of the quantity coefficient of the Pitot tube must not be overlooked. The Pitot tube will always indicate correct velocity head with straight-line flow. With angular flow, however, the velocity head indicated is somewhat greater than the effective straight-line component. The velocity of the water in a closed conduit is greater at the center than it is at the sides. This is responsible for the angularity of flow, inasmuch as the tendency of the water at the center is to move toward the sides, while that at the sides tends to move toward the center. The result is a series of waves with their crests tangent to the center axis of the conduit and their base the inside surface of the conduit. The length of the wave varies with the diameter of the conduit and the mean velocity of the water. The resultant angularity of flow is an inverse function of the length of the wave as well as the mean velocity. It follows then that the quantity coefficient of the Pitot tube will approach unity as the mean velocity in the conduit increases. Experimentation has shown that this coefficient in ordinary practice varies from 0.97 to 0.997.

The ultimate development of the method of measuring the flow of water here described will call for further research in order to determine a complete range of

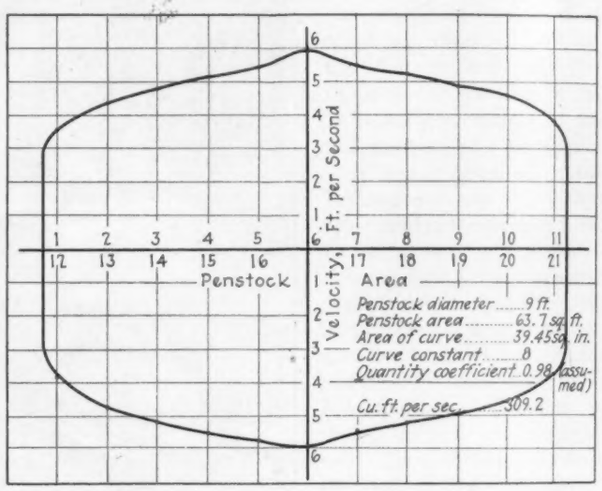


FIG. 4—FLOW CURVE FOR 9-FT. STEEL PENSTOCK

CALCULATION OF VELOCITY OF WATER IN FEET PER SECOND

Taken from readings given photographically in Fig. 2 $V = (2gh)^{\frac{1}{2}}$

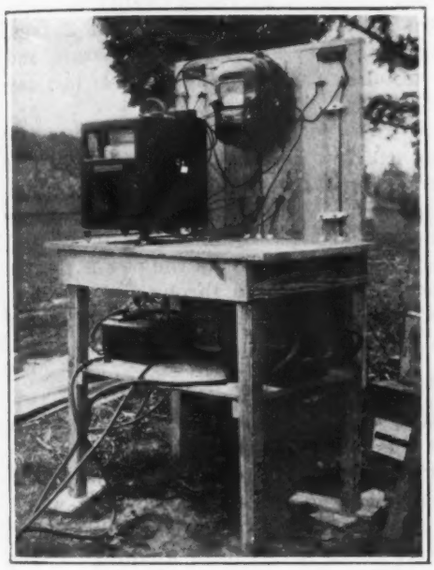
	Tube No.	Reading, Feet	Velocity Head (Hv.)	Velocity (V)
Piezometers.....	1	0.25	....	.....
	2	0.26	....	.....
	3	0.27	....	.....
Average.....	..	0.26	....	.....
Pitot tubes.....	1	0.46	0.20	3.59
	2	0.56	0.30	4.40
	3	0.62	0.36	4.81
	4	0.675	0.415	5.17
	5	0.72	0.46	5.44
	6	0.805	0.545	5.92
	7	0.73	0.47	5.50
	8	0.69	0.43	5.26
	9	0.63	0.37	4.88
	10	0.59	0.33	4.61
	11	0.49	0.23	3.85
	12	0.485	0.225	3.81
	13	0.61	0.35	4.75
	14	0.675	0.415	5.1
	15	0.73	0.47	5.5
	16	0.77	0.51	5.73
	6	0.805	0.545	5.92
	17	0.72	0.46	5.44
	18	0.68	0.42	5.20
	19	0.64	0.38	4.95
	20	0.58	0.32	4.54
	21	0.48	0.22	3.76
Second-feet, from curve in Fig. 4.....				309.2

coefficients that will apply to present-day pipe-line usage. The application of this method to the testing of turbines is very simple, convenient and inexpensive. Fixed conditions of load on the unit can be made and simultaneous readings of all data obtained. No sudden shutting off of the load or loss of time is necessary. A complete series of load settings may be taken in a very short time. The convenient and reliable conditions made possible by this method are those desired in all testing work.

Rural Electrification in Pennsylvania

Records Obtained from Field Surveys — The Influence of Electricity on the Social and Economical Phases of Agriculture — Electrical Equipment Used on Typical Farms—Field Data and Conclusions

By R. U. BLASINGAME*
Professor of Farm Machinery, Pennsylvania State College



AT LEFT, RECORDING-METER INSTALLATION FOR TEST ON SILO FILLING AT THE PENNSYLVANIA STATE COLLEGE. AT RIGHT, FILLING A SILO WITH A 3-HP. MOTOR DRIVE

ELECTRICITY has been found to have a very important influence upon the water supply and disposal of waste on the farms of Pennsylvania. Only 46,402 of 200,000 farms have water piped to the farm buildings, and it has been found that whenever electricity is available one of the first additions to a farm is a water-supply system. Power pumping enables the farmer to get purer water at greater distances from possible pollution and to store it under pressure.

With the installation of a water system the problem of sewage disposal follows, and throughout Pennsylvania there is a widespread interest in the septic-tank system of sewage disposal. Henry B. Eby, a prominent farmer in Lancaster County, installed an automatic water system operated by electricity and in addition septic tanks for sewage disposal, and after experience with the installations said: "I consider the matter of an ample supply of pure water under pressure and correct sewage disposal one of the necessary features of a country home." Other instances were found that indicated the value of electrification in bringing about a water-supply and sewage-disposal installation on farms. Another consideration is that a pressure-water system and perhaps a sprinkler system will reduce fire losses on farms from the present figure of two to three million dollars annually.

In order to gather information on rural electrification several farms were studied in detail. A typical example is one near Lancaster, Pa., owned by Levi H. Brubaker and well supplied with electrical equipment. Energy is purchased from the Edison Electric Company of Lancaster, and two services from the transformers give a single-phase supply for lighting and a three-phase supply for power. The monthly consumption as metered from Feb. 1, 1923, to Nov. 1, 1924, is given in Table I. This table gives an annual monthly consumption for lighting of about 33 kw.-hr. and for power of 180 kw.-hr., but, as will be seen, a wide variation occurs in the monthly consumptions.

TABLE I—CONSUMPTION OF BRUBAKER FARM

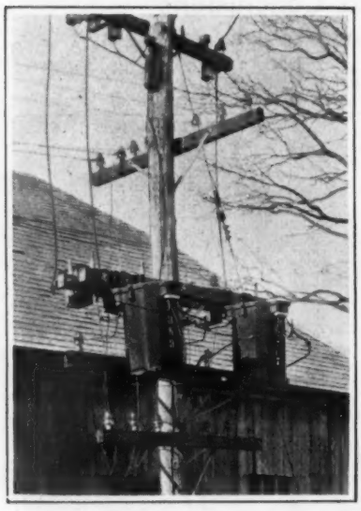
1923	Kilowatt-Hours Lighting	Power	1924	Kilowatt-Hours Lighting	Power
February	46	56	January	31	180
March	134	19	February	37	272
April	61	86	March	25	220
May	20	96	April	25	143
June	15	66	May	22	104
July	17	172	June	21	106
August	12	496	July	26	141
September	15	175	August	34	506
October	20	209	September	28	135
November	28	119	October	50	178
December	29	191	November	44	260
Total (twenty-two months)				730	3,930

The Brubaker farm contains 133 acres and is divided approximately into two equal sections. Each of these sections is further divided into three fields averaging about 20 acres each. Each half of the farm is conducted on a three-year crop rotation as follows: (1) Potatoes, wheat and alfalfa; (2) tobacco, wheat and corn.

This division of the farm into two equal parts and the crop rotation have a direct bearing on the work schedule of the farm and upon the use of electricity in

*Based on a report of the author to the Giant Power Survey in co-operation with the Pennsylvania Department of Agriculture.

the house and in the barn yard. The labor schedule must be adjusted to competitive conditions, as Lancaster is an industrial city, and there must be a schedule that has uniformity in demand because seasonal labor is unavailable. The use of electricity helps smooth the labor curve, and the intelligent farming methods employed also aid greatly. Mr. Brubaker employs three men throughout the year, and for the last three years has hired no extra help. As early as weather and soil conditions permit in the spring the potato ground, usually plowed in the fall, is prepared and planted to early potatoes. The corn ground is then plowed, after which late potatoes are planted. The cultivation of the corn and potatoes and the preparation of the tobacco ground then keep the men busy until tobacco planting early in June and the first cutting of alfalfa. At intervals during alfalfa cutting the corn and potatoes are cultivated and then wheat harvesting occurs. All the wheat is threshed on the field through the use of a 30-hp. motor. Then follows potato digging in July and the marketing of the potatoes after they have been graded by using an electrically driven machine.



A RURAL SUPPLY FOR A FARM AT COLUMBIA, PA.

Tobacco cutting, silo filling and the digging of late potatoes during September and early October come next. The potatoes go to market and corn husking comes into full swing. After plowing the potato ground for the crop of next year, the men turn their attention to the large tobacco sheds, where they prepare the tobacco for market. After the potatoes are graded the grader is moved from the lower part of the barn, and in this space the steers are fed with ensilage during the winter.

This schedule of work shows how uniformly the farm labor is employed profitably throughout the year, and it is this type of intelligent farming that must be had to support electrification.

ELECTRICAL EQUIPMENT USED

Meters are placed in the two services, but in order to determine the performance of individual pieces of electrical equipment watt-hour meters were installed to measure the consumption of the following apparatus:

1. Boggs potato grader, driven by ¼-hp. motor.
2. Westinghouse electric range of the largest house type and containing two ovens.
3. Simplex electric ironing machine, 46-in., 3,600-watt, 220-volt, and operated by a ⅓-hp. motor.
4. Washing machine.
5. Water pump in basement, driven by ½-hp. motor.
6. Water pump in basement for drinking water, lawn sprinkling, garden sprinkling, automobile washing, etc., driven by a ½-hp. motor.
7. An outside water pump to supply water to hogs during the summer, driven by ½-hp. motor.

The range, the three pumps and the ironer are on the three-phase service, and the potato grader and electric washer on the single-phase service. For a three months' period readings of the meters were taken, and the energy consumptions for three months in 1924 are given in Table II.

During September 700 bushels of potatoes were graded, while in October, 1,300 bushels were graded. No data are available on the amount of water pumped. From Oct. 20 to Nov. 7 two silos were filled by using a Papec silage cutter operated by a 30-hp., 220-volt motor. Three teams and three men were used for delivering the corn to the silo. The time required to run three loads through the cutter averaged twenty minutes, six and six-tenths minutes per load of about 2 tons. It took about one hour to bring in the three loads, and only six twenty-minute cutter-running periods per day were required.

It took about 8 hp. to operate the cutter when empty and 30 hp. when cutting ensilage, depending on the uniformity of the feeding. It is interesting to note that the energy consumption for filling a 26-ft. silo was virtually the same as that used in filling a 42-ft. silo.

The other demands for energy from the power service were found to be well distributed throughout the day, not being excessive at any other time than during the operation of the ensilage cutter.

ELECTRICITY INDISPENSABLE IN THE HOME

For a good many years Mr. Brubaker employed help in his house, but this was found unsatisfactory, and he turned his attention to electrical equipment which would eliminate the necessity for household help and would do the chores in a minimum time. "An electric range," said Mr. Brubaker, "does not require kindling or coal or the removal of ashes. The work involved in these operations is for a man to do, and man labor costs money. The electric range is clean, safe, efficient and requires no attention. These same things are true for the water system, vacuum sweeper, washing machine, ironer and other electrical equipment used. It would be foolish to work out an efficient farm plan and have it broken into each day with small jobs about the house which can be done by electricity. Electricity is safe, sanitary and convenient. There are no gasoline radiators to freeze, no difficulties in starting on cold mornings, no fuel storage and handling. Any of my men can start a motor and go off about other work.

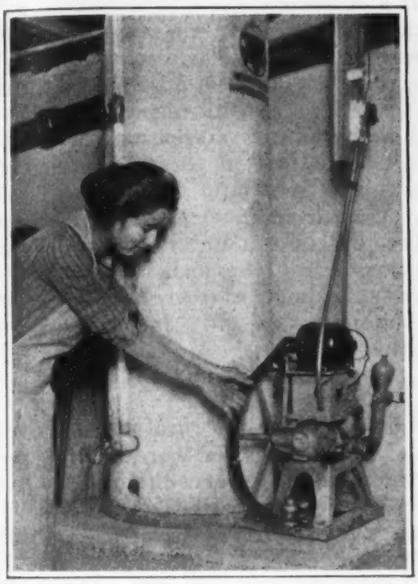
"The home is deserving of everything which makes for ease, happiness and enjoyment," he added. "Electricity affords many of these; for example, when we want ice cream I have a small motor to turn the freezer. The farmer gets sufficient exercise without doing this kind of work. The same motor does the churning, grinds the knives and sharpens the farm tools."

This single farm is seen to afford data and experience sufficient to outline the many elements involved in successful rural electrification.

TESTS ON EQUIPMENT

In addition to studies of farms, tests have been made on electrical farm equipment at Pennsylvania State College. For example, an International Harvester Company ensilage cutter was driven by a 30-hp., 220-volt squirrel-cage motor and tested for performance. The energy used in cutting 609.8 tons was 870 kw.-hr., or the average consumption was 1.426 kw.-hr. per ton. It was thought that a 20-hp. motor would have ample capacity to do the work, and operating experiences indicated that the cutter was too large for the average

farm. Another example is afforded by tests made on a milking machine which could be used to milk four cows at one time. A 10-hp. motor was placed on this machine, and it was operated seven hours in each twenty-four. A recording watt-meter, even over a three-day period, failed to detect any energy consumption, but more precise measurements gave the motor input as 2½ kw., and since the motor was old and inefficient it was thought that a 2-hp. motor would have been satisfactory for milking-machine service.



AT LEFT, DOMESTIC WATER SUPPLY IN A FARM HOME MADE POSSIBLE BY ELECTRIC PUMPS
AT RIGHT, A CONVENIENT GRINDING INSTALLATION FOR A FARM

CO-OPERATIVE HYDRO PLANTS

In Lancaster County several small co-operative hydro-electric plants have been installed. A small group of farmers anxious to electrify join efforts and resources and install a plant and a distribution system. Most of the plants installed have been in operation only a year or two, but the results are very encouraging. This type of development applies in localities where there are small hydro-electric possibilities which may become an appreciable influence in rural electrification. A typical installation was made on Big Chickies Creek at an old mill site. A concrete dam about 130 ft. long and 8 ft. high and a small power house containing a 15-hp. Fitz water-turbine unit 27 in. in diameter were installed A two-wire system leaves the power house and supplies six farms. The total cost was asserted to be $5,000 for the installation and equipment.

Another installation on Little Chickies Creek, very similar in character, supplies light and incidental service to five houses in the neighborhood.

TABLE II—CONSUMPTION OF EQUIPMENT

Equipment	Kw.-Hr. Used		
	September	October	November
Electric range	112.0	206.0	352.0
Washing machine	4	10	17
Potato grader	1	3	3.5
Ironing machine	16	42	63
¼-hp. pump	2	6	10
½-hp. pump	3	9	17
¾-hp. pump	4	10	15
Total	142.0	286.0	507.5

Studies to date show that before rural electrification can be instituted successfully much research work must be done on such elements as

1. Determining a satisfactory rate.
2. Improving existing farm machinery. That existing must be redesigned, reconstructed and to a great extent made automatic.
3. Determining the ratings and sizes of farm machinery best for use.
4. Ascertaining the proper farming methods for insuring the most uniform use of labor and machinery.
5. Educating all parties interested in rural development.

But, however numerous the problems, rural electrification development will go on, and it is advisable that research and educational work proceed rapidly so that intelligent direction may be always available.

Power for the Farm from Small Streams

SMALL streams frequently are neglected sources of power that may be utilized in generating electricity to light buildings and grounds and possibly to operate a number of small machines, says the Bureau of Public Roads, United States Department of Agriculture, in Farmers' Bulletin 1430, "Power for the Farm from Small Streams." Electrical equipment on the farm saves time and labor in the household and farm work, the bulletin says. To be a sound investment, however, the cost of installation should not be greater than the benefits obtained would justify. In this respect, the bureau points out by way of caution, farm water-power electric outfits have their limitations.

In the new bulletin an attempt is made to acquaint farmers with the possibility of developing the power of small streams by converting it into electrical energy. It discusses the uses to which the power can be put. The bulletin gives information that will enable prospective water-power users to avoid unnecessary expense and explains how to determine the power a stream will supply.

Electric Plants in Denmark

Total of 509 Stations Generated or Distributed 193,589,000 Kw.-Hr.—583,982 Meters Are in Service

ELECTRIC power stations in Denmark may conveniently be treated under three classifications, namely, urban, district and rural stations. An urban station is one operating in and supplying a municipality within a relatively narrow radius; a district station is one supplying a relatively wide radius and operating through substations which take the energy from the central station and distribute it to local consumers; a rural station is one which supplies rural communities chiefly or wholly.

There are in Denmark ninety-five urban stations, forty district central stations and 374 rural stations, a total of 509. Of these, eight urban central stations, twenty-four district central stations and six rural stations are not generating plants and are therefore central stations only as to distribution. Eighty-seven urban stations, sixteen district central stations and 368 rural stations, a total of 471, actually generate electrical energy. In addition to these central stations there are some electric plants supplying electricity to a single farm or industrial activity only, but these are of no importance in considering the total energy developed. The district central stations, as just observed, usually supply the electricity through means of substations, which are as a rule owned by the same company as the main station. However, in certain sections of the country these substations, together with the wiring and other equipment, are owned by separate companies.

Of the stations constructed before 1914, the larger part were of a capacity above 25,000 kw., while those constructed after 1914 were mostly below that capacity.

Most of the power stations in Denmark are owned by co-operative societies, this, however, being true only of the smaller stations, since the large urban stations are as a rule owned by the state or community. Most of the prime movers are steam engines, including steam turbines, and 55 per cent of the total output was generated by steam engines. The increased utilization of water power is significant and interesting, since formerly this power was used only in small plants. Its increasing use and its use in larger plants is particularly noticeable in Jutland, where the physical condition essential to its efficient use is more frequently found than in other parts of Denmark.

The consumption of fuel is in the case of urban stations computed at about 115,000 tons of coal and coke, 14,000 tons of fuel oil, 250 tons of peat and 530,000 cu.m. of gas. Figures with regard to the consumption in the district and rural stations are not available except in the case of fuel oil, the consumption of which has been estimated at about 1,400 tons and 3,900 tons respectively. Comparing these figures with those of import statistics, it is seen that the electric power stations' consumption of fuel oil amounts to about one-fourth of Denmark's total import thereof, while their consumption of coal and coke is of no importance compared to the total import.

TABLE I—TOTAL PRODUCTION OF ELECTRICAL ENERGY IN DENMARK

	Kw.-Hr.
Copenhagen's power stations	79,646,000
Urban stations	67,981,000
District stations	31,960,000
Rural stations	14,002,000
Total	193,589,000

PRODUCTION OF ENERGY

The production of energy by the rural stations compared with that of 1921 shows an increase of 8 per cent, while the Copenhagen power stations show an increase of 18.7 per cent. Comparative figures for other urban and district stations are not available. Total production of electrical energy is given in Table I. Twenty-three stations have produced 154,000,000 kw.-hr., or about four-fifths of the total. For the year 1913 the total production was about 66,000,000 kw.-hr., and in 1905 about 10,000,000 kw.-hr.

The amount of electrical energy actually sold by the various classes of plants is given in Table II. The total sales amount to 83.4 per cent of the total production, the loss being due partly to consumption at the stations themselves and partly to unavoidable and normal line losses in the course of distribution. It will be seen from Table II that a little more electrical energy is used for industrial power purposes than for lighting purposes. This is especially true in the case of district stations, while among the rural stations the distribution is about equal. Leaving out of consideration the largest urban stations, proportionately more electric power is used for industrial purposes in the country than in the towns.

From Table III, based on meters installed, it appears that in Copenhagen two-thirds are for lighting purposes and in the provincial cities one-half, while in the country only one-fourth are for lighting purposes.

TABLE II—ENERGY SOLD IN DENMARK (STATED IN 1,000 KW.-HR.)

	For Lighting Purposes	For Industrial Power Purposes	Total
Copenhagen's power stations	26,367	39,178	65,565
Urban stations	23,738	28,558	52,296
District stations	9,952	23,618	33,580
Rural stations	4,928	5,578	10,506
Total	65,015	96,932	161,947

TABLE III—TOTAL NUMBER OF ELECTRIC METERS IN SERVICE

	Light Meters	Power Meters
Copenhagen	186,491	9,359
Urban stations	183,507	16,025
District stations	89,935	28,767
Rural stations	52,126	15,772
Total	514,059	69,923

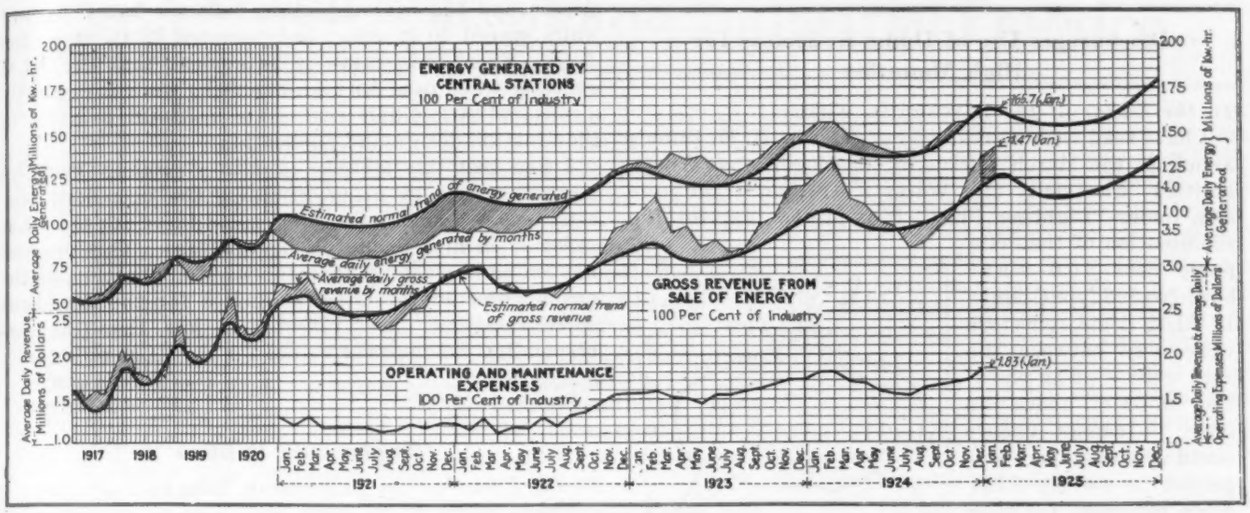
TABLE IV—NUMBER OF METERS IN USE PER 100 INHABITANTS

	Light	Power
Copenhagen	27.6	1.4
Urban stations	24.2	2.1
District and rural stations:		
Islands	8.8	2.6
Jutland	6.5	2.2

TABLE V—SALE OF ELECTRICAL ENERGY PER METER IN KILOWATT-HOURS

	Light	Power
Copenhagen	126	1,704
Urban stations	122	898
District stations	95	354

New Record Output During January


ENERGY GENERATED BY CENTRAL STATIONS
100 Per Cent of Industry
Estimated normal trend of energy generated
Average daily energy generated by months
GROSS REVENUE FROM SALE OF ENERGY
100 Per Cent of Industry
Average daily gross revenue by months
Estimated normal trend of gross revenue
OPERATING AND MAINTENANCE EXPENSES
100 Per Cent of Industry
Average Daily Energy Generated, Millions of Kw.-hr.
Average Daily Revenue, Millions of Dollars
Average Daily Revenue & Average Daily Operating Expenses, Millions of Dollars
Average Daily Energy Generated, Millions of Kw.-hr
1917
1918
1919
1920
1921
1922
1923
1924
1925

CENTRAL-STATION OUTPUT HAS BEEN PRACTICALLY AT THE ESTIMATED NORMAL SINCE NOVEMBER

A NEW record in the amount of energy produced by the central stations of the country was established during January, when a total of 5,138,521,000 kw.-hr. was generated. This figure is 10.7 per cent above that of January last year and indicates a healthy normal growth for the industry. The January output coincided almost exactly with the ELECTRICAL WORLD'S estimated normal output for the month. The consumption of energy by power customers was slightly below that of December, although 4.4 per cent above that of January last year.

The gross revenue of the industry continued to increase to new records, with a total of $134,700,000 during January, which was 11.3 per cent above the estimated normal for the month and 10.8 per cent above the revenue reported for January, 1924. The operating ratio of companies having steam plants only averaged 45.3 per cent during the month. This is the lowest operating ratio recorded by this type of generating plant since the year 1922, when the ELECTRICAL WORLD started collecting data on this item.

TABLE III—OPERATIONS OF CENTRAL-STATION HYDRO AND FUEL POWER PLANTS IN THE UNITED STATES
(100 per Cent of the Industry)

Month	Energy Generated				Fuel Consumption		
	Hydro Plants		Fuel Power Plants				
	Thousands of Kw.-Hr.	Per Cent	Thousands of Kw.-Hr.	Per Cent	Coal (Short Tons)	Oil (Barrels)	Gas (Thousands of Cubic Feet)
November..	1,548,366	33.0	3,142,589	67.0	2,892,138	1,111,068	4,536,881
December...	1,733,123	34.0	3,376,817	66.0	3,173,131	1,328,671	2,940,598
1925							
January....	1,708,621	33.2	3,429,900	66.8	3,218,365	1,466,810	2,791,562

TABLE I—GENERATION AND DISTRIBUTION OF CENTRAL-STATION ENERGY IN THE UNITED STATES
(100 per Cent of the Industry)

Month	Kw.-Hr. Generated Monthly			Distribution of Energy Generated										Energy Purchased by Public Utilities for Resale, Kw.-Hr.	
				Total Energy Consumption by Central-Station Customers, Kw.-Hr.		Energy Consumed for Lighting, Kw.-Hr.		Energy Consumed for Power, Kw.-Hr.		Energy Sold to Electric Railways, Kw.-Hr.		Energy Used in Intracompany Business Including Line Losses, Kw.-Hr.			
	1924 Thousands	1923 Thousands	Per Cent Inc.	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands	1924 Thousands	1923 Thousands
November...	4,690,955	4,485,208	4.4	3,784,955	3,624,208	1,150,000	998,500	2,104,955	2,127,708	530,000	498,000	906,000	861,000	757,500	626,000
December....	5,109,940	4,521,208	13.2	4,122,940	3,649,208	1,204,000	1,045,000	2,371,940	2,089,208	547,000	515,000	987,000	872,000	803,000	731,000
1925	1925	1924		1925	1924	1925	1924	1925	1924	1925	1924	1925	1924	1925	1924
January.....	5,138,521	4,792,704	10.7	4,147,021	3,867,704	1,266,000	1,117,000	2,325,021	2,227,704	556,000	523,000	991,500	925,000	752,800	725,000

TABLE II—CENTRAL-STATION FINANCIAL OPERATIONS FOR THREE MONTHS IN THE UNITED STATES
(100 per Cent of the Industry)

Month	Gross Revenue from Sale of Energy			Operating and Maintenance Expenses			Operating Ratio					
							Steam Plants		Hydro Plants		Combined Steam and Hydro Plants	
	1924 Thousands	1923 Thousands	Per Cent Increase	1924 Thousands	1923 Thousands	Per Cent Increase	1924	1923	1924	1923	1924	1923
November....	120,200	112,200	7.2	51,700	49,200	5.0	46.2	50.0	25.0	24.0	45.0	42.3
December.....	132,000	119,200	10.7	56,700	51,800	9.3	45.8	48.0	27.4	26.2	44.0	44.0
1925												
January.....	134,700	121,400	10.8	56,800	53,350	6.4	45.3	47.0	26.0	24.6	43.4	43.0

Letters from Our Readers

Discourages Use of Dome Reflectors for High Mounting

To the Editor of the ELECTRICAL WORLD:

I have read with a great deal of interest H. H. Dunn's article in the March 7 issue of the ELECTRICAL WORLD entitled "Electricity and Water Filtration." On page 505, under "Lighting Plan," it is stated that for the illumination of the main pump floor 300-watt bowl-frosted type C lamps in RLM dome reflectors were used between the roof trusses at an elevation of 62 ft. above the floor. I cannot understand why engineers will persist in using RLM dome reflectors for high mounting when there are at least two reflectors on the market which are especially designed for high mounting installation.

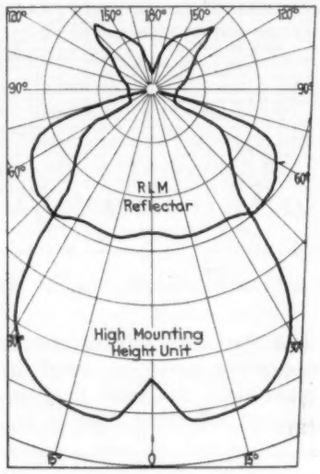


FIG. 1—COMPARATIVE LIGHT DISTRIBUTION

It is to be noted that the candlepower in the lower angles for the high-mounting unit is approximately twice that of the RLM reflector.

On reference to Fig. 1, herewith, it will be clearly seen that the RLM reflector is not suited for high-mounting application as a considerable amount of the flux is at high angles to the vertical and is wasted on the upper side walls. The high mounting units referred to salvage this light flux in the high angles and redirect it in the lower angles, thereby approximately doubling the candlepower in the angles which is effective for producing illumination on the floor when the units, as here, are mounted at some height.

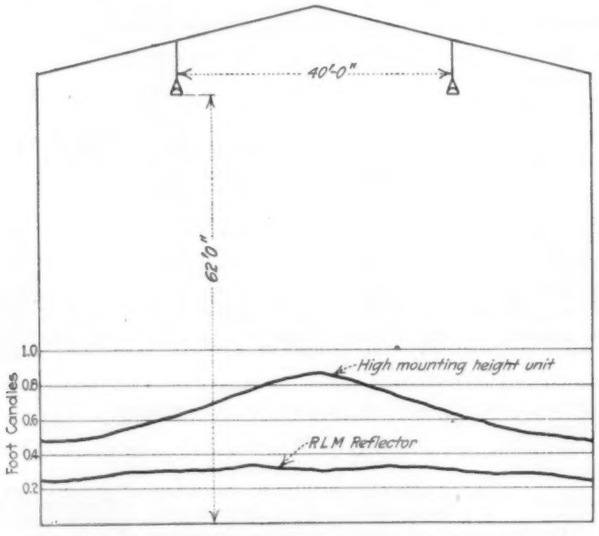


FIG. 2—COMPARISON OF ILLUMINATION ACCORDING TO MOUNTING HEIGHT

Comparative illumination produced on the floor from two RLM and two high-mounting units with 300-watt lamps spaced 40 ft. apart and mounted 62 ft. above the floor. These comparative curves show at a glance the wasteful practice of using RLM reflectors for high-mounting application.

Fig. 2 shows two curves plotted by the point-by-point method for two adjacent units for both the RLM reflector and the high-mounting reflector based on two units spaced 40 ft. apart and mounted 62 ft. above the floor. From this curve it is evident that the RLM reflector when used for high-mounting work is distinctly a misapplication and represents wasteful practice in illumination design and application.

I find that this mistake is quite commonly made by engineers, and in many instances the deep-bowl porcelain-enamel steel reflector is substituted for the RLM reflector in high-mounting installations. This practice is even more wasteful than the RLM application, as the candlepower in the effective angles for the deep-bowl porcelain-enamel steel reflector is less than the corresponding candlepower values for the RLM reflector.

Holophane Glass Company.
New York, N. Y.

DAVIS H. TUCK,
Electrical Engineer.

Superpower Defined

To the Editor of the ELECTRICAL WORLD:

There seems to be some confusion as to just what "superpower" means. As I see it, superpower means the solution of the regional electric power problem for a given condition in a "superior" way. This may mean a local steam or gas engine electric plant in one case, it may mean adequate interconnection in another, and it may mean the bulk transmission of electric power in a third.

For the electric industry today superpower will generally mean the mass production and transmission of electrical energy to be distributed to many communities and industries for their needs and for the benefit of mankind. Superpower today means generally large efficient generating units and stations, with commensurately large transmission capacities and distribution through large primary substations. Large regional power districts are a prerequisite to the development of superpower.

Technically the superpower system will come to mean a constant-potential, reversible electric power system. When the necessary synchronous condensers are properly added to give a constant-potential system, we inherently produce the characteristics required for economy, safety and flexibility in operation for large-scale power problems.

It requires no prophet to predict that the interest of the electric power industry will for the next few years be centered in the high-voltage transmission of energy. The development of the industry has been very rapid, and progress will continue if natural forces are allowed to function along natural economic lines, unhampered as far as possible by those who think in terms of political power rather than electric power.

The industry should tell to the people direct the story of the progress attained and that hoped for and being worked for and should not try to compete with the politicians. The industry has the advantages that great things have been accomplished and that it has a fair reputation for truth. On the other hand, the politician is generally at the disadvantage of not knowing much about the electrical industry. Moreover, as one of my electrical friends says, "the politician is generally such an awful liar that he has to have his neighbor call his dog for him when he wants to feed him."

FRANK G. BAUM.
San Francisco, Cal.

Central Station and Industrial Practice

Closing High-Tension Oil Switches After Trouble

BY J. R. DOWDELL
Plant Electrician Houston (Tex.) Lighting & Power Company, Houston

SHOULD any difficulty be experienced in closing a 2,300-volt remote-control oil switch, it will usually be found advisable first to inspect the control-circuit fuse or fuses. With the control system used by the Houston Lighting & Power Company the fuse is in the circuit of the closing coil, the closing relay and the tripping coil. If trouble still exists after continuity of the control circuit has been checked or restored, the operator on this company's system will open all six of the oil-circuit-breaker disconnecting switches and try to close the oil switch by actuating the relay contact. Should the oil switch then close, the trouble is evidently in the relay circuit.

If the operator is successful in closing the oil switch by actuating the relay contact, he closes the oil switch and tests it to see if it will open properly and dependably by tripping it from the control panel both by the remote-control tripping switch and the relays. The operator will not close the oil switch while the disconnecting switches are in, if he is unable to trip the oil switch with either the relay or remote-control tripping switch. If the trouble is in the relay circuit, the operator will examine the remote-control switch contacts, making adjustments by screwing the cone-shaped contact in or out. Should any of the 2,300-volt oil switches give trouble that the operator is unable to locate, the plant electrician is notified at once.

The 2,300-volt oil switches may be closed with the manual operating bar, but this is hazardous with generator switches unless the generators are first synchronized. Oil switches are not allowed to be closed when the disconnecting switches are in if the operator has experienced trouble in closing with the remote control, unless he can trip the switch from the remote-control panel.

If the oil switch is closed and the operator is unable to trip the switch with the remote-control switch or the relay, he renews the fuses and tries again. If he is still unable to trip the switch, he cleans and examines the finger contacts for the pilot lamps to see that they are making good contact. Trouble here will be indicated by lighting of the two pilot lamps which are in series. If the trouble is not located at either of the two points, the operator examines the remote-control switch to see whether that is making good contact, adjustment thereof being made if necessary.

If after making all of the foregoing trials the operator is still unable to trip the switch from the board, he notifies the plant electrician so that the latter can test the circuit and make necessary repairs. However, if it is necessary to open the switch without delay the operator will trip the switch manually by tapping the tripping plunger and if necessary insert the manual-control bar in the operating mechanism and pull downward on the oil-switch gear.

Portable Meter-and-Service-Switch Cabinet for Outdoor Use

BY KARL BAUSMAN
Supervisor of Meter Department Dayton (Ohio) Power & Light Company

THE occasion frequently arises where a meter and service switch must be housed for outdoor use of an emergency or temporary character. To meet this requirement and also to make them readily available for installation, the Dayton Power & Light Company has made a number of portable meter-and-service-switch boxes which are equipped, wired and ready for use. They are made for services up to 400 amp. and also for housing the meter in conjunction with outdoor installations of current and potential transformers.

The inclosure consists of a shallow rectangular wood cabinet with a roof and double doors, the top one covering the meter and the lower one covering the service switch. The upper

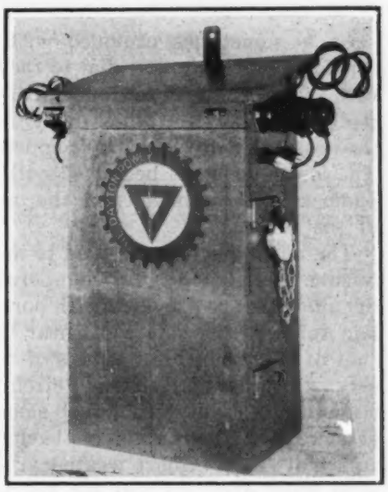
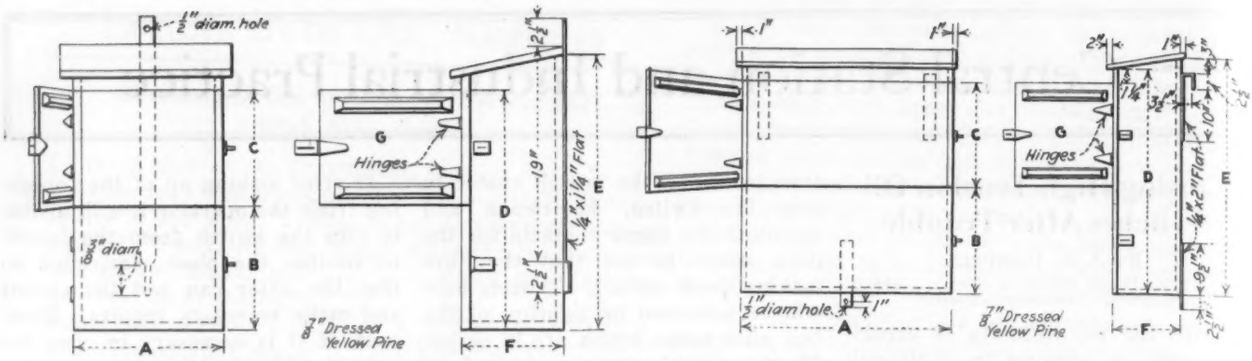


FIG. 1—EXTERIOR OF ONE OF THE 230-VOLT OUTDOOR METER BOXES

TABLE I—EQUIPMENT USED IN 230-VOLT OUTDOOR METER BOXES

Box Rating							
Phases		1 or 3	3	1	1	1	1
Wires		.....	3	3	3	2	3
Amperes		200	100	100	60	30	30
Service switch (230-volt)	Number	1	1	1	1	1	1
	Amp.	200	100	100	60	30	30
	Poles	.....	.....	3	3	2	3
	Phases	.....	3	1	1	1	1
Iron box	Number	1	.....	.....	.....	.....	.....
	Size (in.)	12x15x15	.....	.....	.....	.....	.....
Cut-out	Number	1	.....	.....	.....	1	.....
	Amp.	200	.....	.....	.....	30	.....
	Type	S3	.....	.....	.....	2-pole	.....
House brackets (screw type)	Number	6	6	6	6	4	6
Box bushings	Number	6	6	6	6	4	6
	Type	No. 13,225	½ in. x 3 in. por. tube	½ in. x 3 in. porcelain	½ in. x 3 in. porcelain	½ in. x 3 in. porcelain	½ in. x 3 in. porcelain
Loom	Feet	25	20	15	15	10	15
	Size (in.)	¾	½	½	½	½	½
Copper Wire	Feet	50	50	40	45	20	30
	Size	No. 2/0	No. 4	No. 4	No. 6	No. 10	No. 10
	Kind	R.C.S.*	R.C.S	R.C.S.	R.C.S.	W.P.†	W.P.

*Rubber-covered stranded wire. † Weatherproof solid wire.



FIGS. 2 AND 3—STRUCTURAL FEATURES OF 200-AMP. AND 30-AMP. OUTDOOR METER BOXES

TABLE II—MAJOR DIMENSIONS IN INCHES OF 230-VOLT OUTDOOR METER BOXES

Rating of Box			A	B	C	D	E	F	G
Amp.	Wires	Phases							
200	....	1 or 3	38	19½	19½	41	43	12	5
100	3	3	25	19½	19½	41	43	12	3
100	3	1	18	15½	15½	32	34	12	3
60	3	1	18	11½	11½	24	26	10	3
30	2 or 3	1	13	10½	10½	20½	24	9	3

door is sometimes provided with a window over the meter dial to facilitate reading and is equipped with a padlock, the key for which is held in the possession of the utility company. The lower door can be locked with a padlock by the consumer or the user of the service.

The outfits to be connected to low-tension secondaries for temporary installations are provided with porcelain tubes in the side walls near the roof of the cabinet for egress of the service circuits and customer circuits respectively. These tubes are sloped downward on the outside to exclude rain and snow. Short weatherproof wire leads are provided for service connection and customer's wiring. Outside the porcelain tube, just below the roof of the cabinet, are attached screw-type house brackets which serve to hold the wires in place.

When the cabinets are to be used in conjunction with primary outdoor metering installations, the utility company's circuits are led to the box through 1-in. conduit from the instrument transformers, leads being identified by a color scheme.

As previously mentioned, the meter is placed back of the upper door and the service switch back of the lower door. The service switch is of the safety type with the main fuses separated from the customer's fuses and sealed from access to every one except the utility company's representatives. The service switch is operated by an external handle which is accessible to the customer. A meter trim is attached to the upper part of the service box so that the terminals of the meter are inaccessible, even if the upper door of the wood cabinet is broken.

The meter is usually fused at the capacity of the switch and the customer's fuses according to the capacity of the load, but the latter fuses are accessible to the customer. Customer's fuses are installed in the meter box on 30-amp. size only.

These cabinets are provided with two types of hanger irons. The smaller cabinets are equipped with a piece of formed strap iron mounted on the back of the cabinet and so designed that, with the use of a lag screw and a staple, the cabinet can be mounted with a minimum amount of labor. The larger boxes are equipped with two hooks mounted on the back of the cabinets close to the top and so formed that the cabinet can be hung on a cross-arm in the same manner as a transformer.

Inexpensive Underground Construction

Concrete Tile Used for Transformer Vaults in Residential Districts—Total Cost of Installation Is Approximately $40

BY N. B. HINSON
Planning Engineer Southern California Edison Company, Los Angeles

IN CERTAIN high-class residential sections where the homes are built on large lots the property owners often object to unsightly poles, transformers and wires of overhead electric services. In Santa Barbara County in California, where the homes are in the foothills on large lots of an acre or more, the property owners have insisted on underground construction. The cost of standard underground construction to feed one house, or at the most a few houses, would in most of these cases be prohibitive.

A special type of underground construction has been developed by W. E. Boden, district superintendent of the Southern California Edison Company at Santa Barbara, to meet the situation in his territory. There is usually a pole line somewhere in the vicinity, at the bottom of a canyon or on some back road, the houses often being on a knoll or side hill.

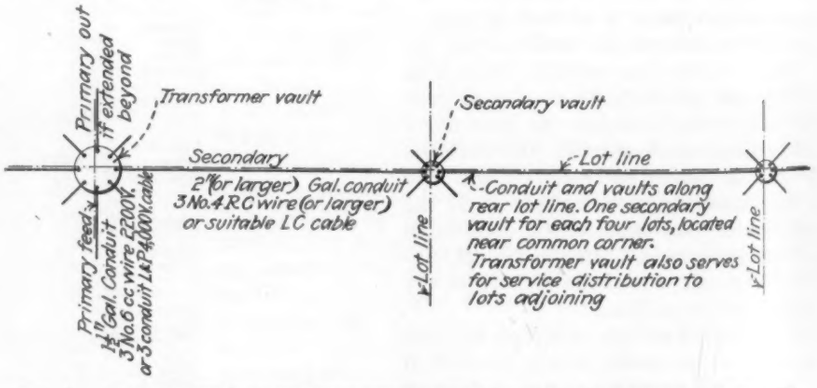

Primary out 11' extended beyond
Transformer vault
Secondary vault
Secondary
2" (or larger) Gal. conduit 3 No. 4 R.C. wire (or larger) or suitable L.C. cable
Lot line
Conduit and vaults along rear lot line. One secondary vault for each four lots, located near common corner. Transformer vault also serves for service distribution to lots adjoining
Lot line
Lot line
Primary feed 1½" Gal. Conduit 3 No. 6 cc wire 2200V or 3 conduit L&P 4000V cable

FIG. 1—ARRANGEMENT OF UNDERGROUND SYSTEM USING CONCRETE PRIMARY AND SECONDARY VAULTS AND GALVANIZED-IRON CONDUIT

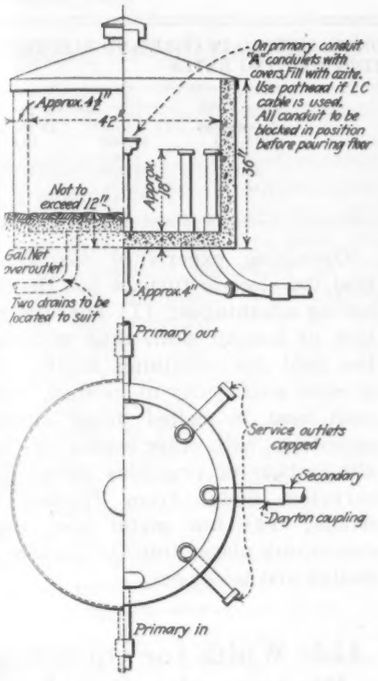

On primary conduit "A" conduletswith covers Fill with ozite. Use pothead if LC cable is used. All conduit to be blocked in position before pouring floor
Approx. 4½"
42"
Approx. 18"
36"
Not to exceed 12"
Gal. Net over outlet
Two drains to be located to suit
Approx. 4"
Primary out
Service outlets capped
Secondary
Dayton coupling
Primary in

FIG. 2—TYPICAL TRANSFORMER VAULT—LIST OF MATERIAL

One concrete tile, 42 in. inside x 36 in.
One galvanized-iron cover with ventilator.
Two 1½-in. conduit bends for primary.
Four 1½-in. conduit bends for services.
Two 2-in. conduit bends for secondary.
Two 1½-in. A condulets with covers.
Four 1½-in. pull bushings.
Two 2-in. pull bushings.
Two 2-in. conduit nipples 18 in. long.
Six 1½-in. conduit nipples 18 in. long.
Six 1½-in. conduit couplings.
Two 2-in. conduit couplings.
Two 2-in. Dayton couplings.
Four 1½-in. pipe caps.
Two safety hasps for cover.
Material for 6 cu.ft. of concrete, rich-mixture "Ozite."

Estimated labor, etc., to install, not including excavation, $10.

METHOD OF INSTALLING UNDERGROUND SYSTEM IN A NEW TRACT

The large conduit carries the primary circuit and the tile in the foreground is a primary pull box; the tile in the background is the transformer vault.

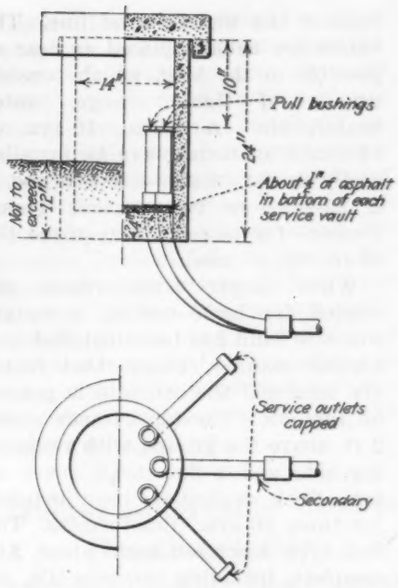


FIG. 3—SECONDARY DISTRIBUTION VAULT—LIST OF MATERIAL

One concrete tile, 14 in. inside x 24 in., with concrete cover.
Two 2-in. conduit bends for secondary.
Four 1½-in. conduit bends for services.
Two 2-in. pull bushings.
Four 1½-in. pull bushings.
Four 1½-in. pipe caps.
Two 2-in. conduit nipples, 10 in. long.
Four 1½-in. conduit nipples, 10 in. long.
Two 2-in. conduit couplings.
Four 1½-in. conduit couplings.
Five pounds roofing asphalt.
Material for 2 cu.ft. concrete.

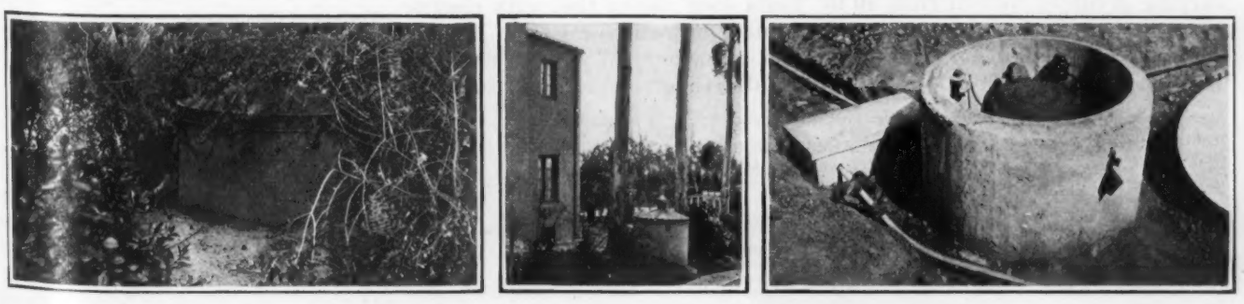
Estimated labor to install, not including excavation, $3.

From the pole line a 1½-in. galvanized-iron conduit is run to a point close to the load. A location that will not be conspicuous or one that can be covered with vines or surrounded with shrubs is chosen for the transformer vault. The conduit is equipped with FE condulets at the pole end and in the vault and at the pull boxes when the latter are used. The conductors used are two or three No. 8 or No. 6 varnished-cambric tape and braid weatherproof wire, the insulation being $\frac{4}{32}$ in. around the conductor and rated at 3,000 volts.

The vault consists of a concrete sewer tile 36 in. long and 33 in., 36 in. or 42 in. in inside diameter, depending on the size of transformer to be installed. First a hole is dug about 2 ft. deep and the necessary conduits for the primary incoming and secondary outgoing lines as well as a drain pipe are installed. Four bricks are laid in the bottom of the hole and the concrete tile up-ended on these. The concrete floor is then poured, sealing the bottom of the tile. A special galvanized cover shown herewith is used. It is fitted with a globe ventilator at the top. This cover is arranged so that it can be locked onto the tile. The primary cut-outs are mounted on the side of the tile as shown in one of the illustrations.

If the primary run is larger than can be made in one pull, special openings are provided consisting of a 1½-in. x 1½-in. x 3-in. galvanized "T," equipped with a 6-in. x 3-in. nipple and a 3-in. cap. The ends of the wire are left about 6 in. long, the nipple being off. After they are joined, soldered and taped up with cambric, which is easily done as the ends are out in the open, the nipple is screwed on and a piece of 2½-in. fiber duct is slipped down inside between the taped ends and the pipe nipple. The cap is then put on and the joint is water-tight, yet it can be worked on by the removal of the cap, nipple and fiber liner. On some of the later jobs where a whole tract is being covered or side taps are run, a small concrete tile has been installed and used as a pull box instead of the above-described "T."

Lightning arresters and primary cut-outs are installed on each underground line where it taps onto the overhead line so as to protect the wire and to make it possible to dis-



NEAT-APPEARING VAULTS FOR RESIDENTIAL SECTIONS

At left, concrete tile vault concealed with shrubbery. In center, typical transformer vault installation at rear of house near kitchen. At right, special transformer vault with cover removed; small square pull box contains telephone cable.

connect the underground line. The vaults are usually placed as near as possible to the load, which consists usually of lights, range, water heater, etc. A 5-kva., 10-kva. or 15-kva. transformer can be installed easily in the smaller-size tile, and if a 25-kva. or two smaller transformers for power are required the 42-in. tile is used.

When larger transformers are needed for large motors, a square concrete vault has been installed in a similar manner, except that forms are used and the concrete is poured on the job. The top extends about 2 ft. above the ground with vents on the side and a flat metal cover on top. Such vaults have been installed for three 50-kva. transformers. The first type described costs about $40 complete, including concrete tile, cement floor, drain, conduit "L's," cover, ventilator, locks and labor.

The transformer vault and incoming and outgoing conduit are paid for and owned by the consumer, the power company furnishing and owning the transformer and primary and secondary wire.

Electric Bronze Furnaces Save $3 per Ton

BY F. C. HEATH
Chief Engineer Federal-Mogul Corporation, Detroit

PRODUCING 23,000 lb. of bronze a day from five Detroit rocking-type arc electric furnaces, the Federal-Mogul Corporation, Detroit, has estimated a saving of $3 per ton over coke fires. An analysis of operating costs is given in Table I. This is a carefully checked estimate since the plant is running both coke and electric fires with the same apparatus and for that reason it is difficult to keep separate records. The average consumption of electrical energy is 325 kw.-hr. per ton with an average electrode consumption of 6½ lb. per ton. This is based on smelting bronzes varying in copper content from 80 to 88 per cent; in tin content, 5 to 10 per cent; lead, 5 to 10 per cent; zinc, 1 to 5 per cent.

TABLE I—COMPARATIVE COST ESTIMATE FOR OPERATION OF COKE AND ELECTRIC FURNACES

Coke Fires		Electric Furnaces	
Coke, at $8 per ton	$5.20	Electric power	$6.50
Crucibles	2.10	Electrodes	1.69
Wood	0.30	Linings	0.56
Charcoal	0.30	Charcoal	0.30
Repairs on linings	0.90	Repairs on linings	0.20
Metal loss, 3 per cent	5.20	Metal loss, 0.6 per cent	1.80
Labor	0.50	Labor	0.32
Total	$14.50	Total	$11.37

TABLE II—PHYSICAL PROPERTIES OF BRONZES MELTED IN COKE AND ELECTRIC FURNACES WITH VARYING MELTING RATES

Type of Furnace	Coke Fired	Electric	
Melting time	75 minutes	17 minutes	25 minutes
Elastic limit, lb. per sq.in.	15,560	16,560	16,610
Elastic limit, kg. per sq.cm.	1,094	1,164	1,168
Ultimate strength, lb. per sq.in.	30,900	30,620	28,940
Ultimate strength, kg. per sq.cm.	2,172	2,153	2,035
Elongation in 5 cm., per cent	17	17	18.5

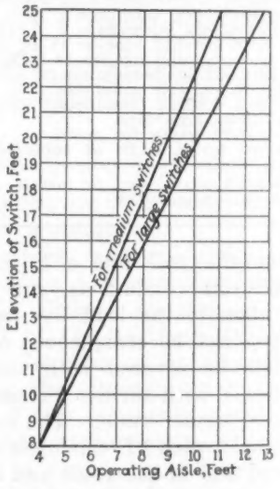
The five Detroit furnaces are rated at 250 lb. This small-capacity furnace was chosen in order to preserve the flexibility of operation, since it is necessary to wait no longer than a half hour if a quick change in the melting program is found necessary, as it frequently is in melting fifteen varieties of bronzes. Each furnace was originally equipped with a 60-kva. transformer which produced between twelve to fifteen heats per furnace per day. Upon learning that the bronzes could be melted faster the transformer capacity was increased to 100 kva., which now provides twenty-one heats per day with an average time of melting of seventeen minutes. Adding six minutes for unloading and loading the furnace, the total operating cycle is twenty-three minutes. Comparing this with the number of heats taken from the coke bars, it is found that their melting time runs between one and one-quarter and one and one-half hours, or six heats per day. The comparison in physical property of bronzes smelted in both types of furnaces is given in Table II.

Although the metal is not changed upon rapid melting, the limiting factor in production is the lining. With a rate of input of 75 kw., a lining life of 2,000 heats is available, but upon increasing this rate of input to 90 kw. or 100 kw. experience has shown it to be uneconomical to run the lining over 1,000 heats. So a balance must be struck between the rate of energy input and the life of the lining. Offsetting the lower lining life with electrical operation, there is the added advantage of low metal loss. Tests have shown that with electric furnace operation a loss of 0.6 per cent is present. With coke fires, the metal loss may be as high as 2 per cent.

Operating experience has shown that the electric furnace has the following advantages: (1) The elimination of human skill, thus widening the field for obtaining labor; (2) greater uniformity of product, since each heat is melted under similar conditions with other heats; (3) the elimination of crucibles except for carrying metal from furnace to molds; (4) low metal loss, since everything placed into the furnace is melted and taken out.

Aisle Width for Operating Disconnecting Switches

IN ORDER that sufficient room be available for the operation of disconnecting switches, the Utica Gas & Electric Company uses the width of aisle given in the accompanying chart. Whenever a new installation is laid out these figures are always adhered to. The tabulation of isolation by elevation of the National Electrical Safety Code is given simply to afford additional information.



OPERATING ISLE FOR SWITCHES

ISOLATION BY ELEVATION

Voltage of Conductors	Elevation in Feet
300-750	7
750-2,500	7½
2,500-7,500	8
7,500-30,000	9
30,000-70,000	10
70,000-100,000	12
More than 100,000	14

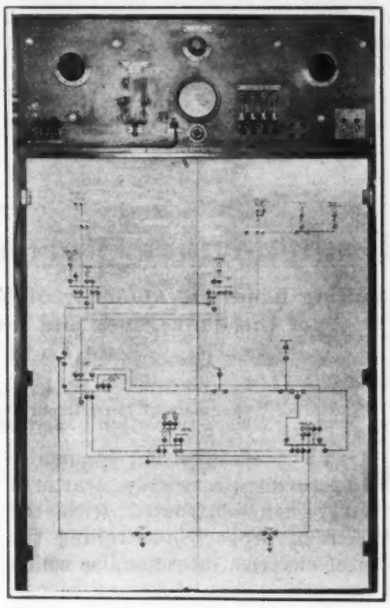
System Calculating Board

BY E. F. PEARSON
Electrical Engineer Northwestern Electric Company, Portland, Ore.

ALTHOUGH many system-calculating boards for short-circuit currents have been constructed, each differs from the other in some important respects, according to the ideas of the designer. A calculating board was recently built by the Northwestern Electric Company, Portland, Ore., which has some interesting features. It is of the upright type, as shown in the accompanying illustration, with doors which open from the front to provide easy access to the resistors and wiring on the back of the diagram board. A small panel on top contains a voltmeter, switches and the necessary rheostats for controlling the direct-current supply from the building service. A portable milliameter is placed on a typewriter bracket on one side of the board so it can be swung around in front of the board handy to the operator.

The board is of the constant-voltage direct-current type. One ampere at 110 volts direct current on the board is equivalent to a system load of 100,000 kva., alternating current. Resistances of the proper value are used to represent impedances of all 66-kv. and 11-kv. lines and transformers. Resistances are also used to represent reactances of all synchronous apparatus such as generators, phase modifiers and large motors. Standard telephone jacks are used both for switches to cut in or out portions of the system, generator units, etc., and provide contracts for the short-circuit cord. All stations on the board have spare jacks connected to buses, and by the use of a calibrated variable resistance proposed additions to the system, such as tie lines and generators, can be quickly set up and the resultant normal load and short-circuit currents determined.

In order to use the board for normal load determination the short-circuit cord is plugged in at any desired point and the variable resistance in the main circuit is used to reduce the short-circuit current to normal load values. Standard resistor units of the industrial control type were used for fixed units and also for sections of the variable calibrated resistance unit. Standard field rheostats were used for voltage and load variation. These units have a low temperature coefficient, and care was taken to have ample current-carrying capacity so that no appreciable variation in resistance due to heating has been encountered.



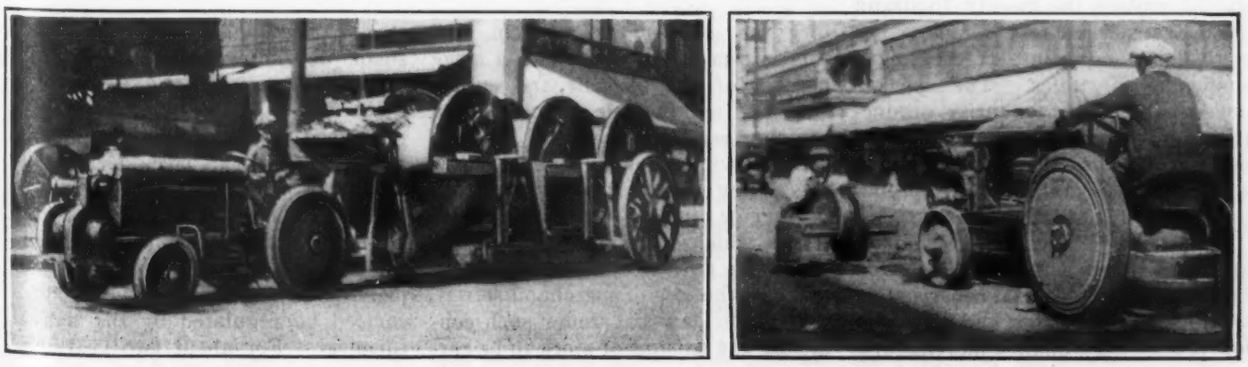
SYSTEM CALCULATING BOARD BUILT BY NORTHWESTERN ELECTRIC COMPANY

Some comments might be made on the use of line and transformer impedance instead of reactance for system characteristics. If reactance alone was used for system characteristics, the short-circuit currents as read on the board would be larger than actual, and in cases where long lines of considerable resistance exist this would result in a considerable error. On the other hand, by using impedance values for lines and transformers an error would exist in reducing short-circuit kva. to current values as taken from current-time-reactance curves. However, by applying a correction factor when using such curves the error will be negligible. Again, by using impedance instead of reactance for lines and transformers the board can be used to measure normal loads carried by any one of several lines operated in parallel. This latter use is of considerable assistance in checking figures on proposed tie lines and loop circuits.

Tractor and Trailer Used in Handling Cable

WHEN pulling lead-covered cables through duct lines under the streets of San Francisco the Great Western Power Company uses a low bed trailer on which have been built special heavy supports for mounting three reels of cable, as shown in one of the accompanying illustrations. Cable may be unwound from any one or all three of the reels simultaneously without removing them from the supports. Considerable saving in time and money is thereby effected as previously it was necessary to roll a reel on the street near the manhole and jack it up for pulling the cable through the duct line.

Another time-saving and labor-saving device is the use of the tractor, as shown by the pictures, for pulling cables and hauling the trailer. Cables were previously pulled through the ducts by means of a hand-operated winch requiring four men half an hour to an hour to pull a cable a distance of a block. Through the use of the drum on the tractor one or several cables can be pulled a distance of a block in about ten minutes and the services of the four men are eliminated.



AT LEFT, TRACTOR PULLING SPECIAL CABLE TRAILER. AT RIGHT, PULLING CABLE WITH WINCH ON TRACTOR

Commercial Activities and Public Relations

Load-Development Fields Outlined at Boston

POSSIBILITIES of load development before the central-station industry were portrayed by prominent national chairmen of N. E. L. A. Commercial Section committees at an all-day meeting in Boston, March 20. Julius Daniels, chairman of the New England Division Commercial Section, presided, and the discussions covered lighting, transportation, public relations, electric ranges, appliance sales commissions and commercial managerial problems.

Charles C. Munroe, Detroit, pointed out that analyses of one million items taken from the "better home-lighting" primers show that the wattage used is only 51 per cent of that specified for the so-called "conservative ideal" home. Only about one-third of the convenience outlets, wall brackets and portable lamps set up by this standard have been installed, and 23 per cent of the lamps reported were minus shades. It is estimated that one billion dollars' worth of wiring must be done to meet the requirements of the above home.

Ninety-eight cities reported the sale of 308,198 kitchen-lighting units, bringing $1,067,000 in additional yearly revenue to these central stations. Fourteen companies reported the sale of 21,374 portable lamps, increasing the revenue by $77,886. Fifty thousand electric signs were sold last year by companies reporting, a gain of 20 per cent over 1923.

Emphasizing the triple congestion of traffic caused by horse transportation in cities, B. J. Martin, Chicago, pointed out that if electric trucks should replace the twenty thousand horse-drawn vehicles in Chicago, the equivalent gain in street length would be 20 miles. The speaker urged the need of quantity production for electric trucks and commended the practice of developing electric transportation sales specialists in central stations.

E. W. Lloyd, Chicago, attacked the high cost of house wiring, declaring that the use of all-metal construction would stifle expansion and said that low-priced, high-quality merchandise is greatly needed by the industry. Higher intensities in window illumination, even up to 2,900 ft.-candles, and standardization on 250-cp. street lamps, instead of the 40-cp. units so widely used, were recommended. Better commercial training and closer liaison with other industries are vitally important.

S. D. Heed, Cincinnati, described the advanced type of salesmanship needed in the industry today. Other speakers were A. Jackson Marshall, New York; F. F. Kellogg, Pittsburgh; W. R. Putnam, chairman of the Commercial National Section, Boise, Idaho; V. M. F. Tallman, Boston; C. O. Dunten, for A. C. McMicken of Portland, Ore., and T. F. Kennedy, New York.

Branch-Office Merchandise Stock Control

Limiting Kind and Quantity of Merchandise Reduces Accumulation of Unsalable Stock and Increases Turnover—Exercise of Local Judgment

BY C. O. DUNTEN
Manager Commercial Department Central Illinois Public Service Company, Springfield, Ill.

MANY central-station companies operating in widely scattered territory are confronted with the problem of properly controlling the stock of electrical merchandise which is carried at the different offices. The more widely scattered the territory the greater the problem, and this is especially true where a large number of small towns are served, and it is not feasible to maintain a complete selling and clerical force in each individual town. In such cases the selling and control of the stock is largely in the hands of local forces which have many and varied operating duties of as great importance as the sale of merchandise.

It is obvious that under such conditions the amount of stock to be carried in each town should be regulated from some central point where a proper study and analysis of the merchandise sales can be made. If the amount of stock being carried is left entirely in the hands of the local operating forces, in many cases the stock carried will be too large or too small, depending upon the interest or indifference of the local force concerned.

A good system demands that the control of stock, both as to the quantities to be carried and the lines to be handled, shall rest at a centralized point where a careful study can be made of the different lines of merchandise and the amount of stock carried be regulated by the annual turnover. For about two years the

ELECTRIC STOCK

Class	Electric Range	Electric Ironer	Washing Machine	Vacuum Cleaner	Electric Iron	Percolator	Toaster	Curling Iron	Waffle Iron	Fan	Electric Heater	Table Stove
A	4	1	5	4	9	5	5	6	4	12	5	3
B	3	0	4	3	7	4	4	5	2	8	4	2
C	2	0	3	2	5	3	3	4	2	6	3	2
D	1	0	2	1	3	2	2	3	1	4	2	1

Class A indicates towns of 2,000 Electric Customers or more.
Class B indicates towns of 1,000 to 2,000 Electric Customers.
Class C indicates towns of 500 to 1,000 Electric Customers.
Class D indicates towns of 500 Electric Customers or under.
Electric Heaters and Fans are considered as Standard Merchandise Stock only in season.
The above number of appliances are to be in stock or on order at all times.
Inter-District Shipping will be eliminated to the greatest possible extent.
Used and shopworn appliances must be disposed of in the towns where they develope.

CHART OF MERCHANDISE STOCK FROM WHICH SELECTIONS CAN BE MADE IN TOWNS OF DIFFERENT SIZE

Central Illinois Public Service Company has had in effect a system which meets all of the above conditions. The towns served are divided into four groups, according to the number of electric customers in each town. To each group of towns is assigned a standard stock of all major appliances, and this stock is maintained at all times as to quantity.

Under this system of regulating the stock the different competitive lines of merchandise which are to be handled are selected at the general office, and the employees in the local offices have the option of deciding the quantities of each particular line which they desire, provided that the total number does not exceed the standard stock. As an example, three different lines of electric ranges have been selected as standard, and the local office employees are permitted to select their entire stock from one line or from all three lines, provided they do not exceed the number of ranges they are permitted to carry according to the class in which their town falls.

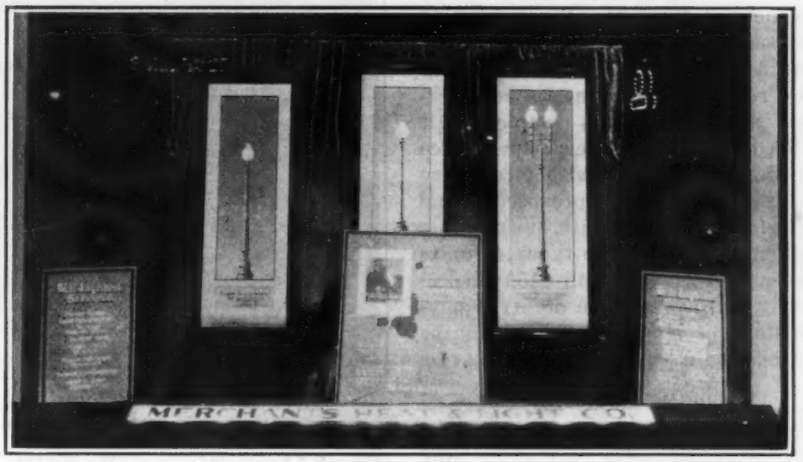
Another happy feature of this plan is that it permits the reduction or increase at will of the total investment which the company has in merchandise stock without materially affecting the total sales. When a stock of merchandise is reduced through the curtailment of purchases, it results in those offices which are active in selling merchandise being entirely without a stock, while the offices where sales are slow will still have a fairly complete stock. The reverse situation is, of course, the one desired. Under this plan it is possible to reduce the investment in merchandise by reducing the number of appliances carried in each town, with the result that all towns are treated equally, and in the majority of cases the total gross sales will not be materially affected.

Before this plan was placed in effect it was customary to ship appliances from the overstocked offices to the other towns in order to reduce stock. Each superintendent, however, would always ship the used and reclaimed appliances which he had in stock and keep the new appliances. This, of course, was very unsatisfactory, and under the present plan of a standard stock in each town it is necessary for each superintendent to move his own reclaimed and shopworn appliances before he is able to get a new stock.

Exceptions are made to the standard stock only when a campaign on some particular appliance for a limited period is contemplated. Under such conditions, whatever stock is considered necessary is shipped to the territory where the campaign is to be held and the surplus stock is returned to the general warehouse after the campaign has been completed.

In order to have this plan of a standard stock function properly, it is best to carry at some central point a small surplus stock of appliances which cannot be obtained promptly from the manufacturers. Quick shipments are essential so that stocks will not be depleted, and the amount of money that is invested in the warehouse stock will vary according to the location of the territory with reference to the warehouses of the manufacturers.

Advertising New Street-Lighting Equipment



TO CAPITALIZE on the popular interest in the new street-lighting system of Indianapolis, installation of which has just started, the Merchants' Heat & Light Company is displaying in a prominent window large pictures of the high-candlepower lamps and ornamental standards that will replace the present low-candlepower lamps and will increase the total illumination of the streets by more than 1,000 per cent.

In the downtown commercial section of the city 225 twin-light standards with 20 ft. mounting height will be used, giving an illumination twenty times that available from the present system. Main thoroughfares will be lighted by 1,148 single units on 15-ft. standards. The outlying streets will be lighted by 1,149 lamps of smaller rating on 12-ft. standards. Pendent-type units will be used in residential districts.

The Central Station and the Refrigerator

Duty of Pioneering Development and Servicing Electric Machines Devolves Upon Electric Light and Power Industry, Which Will Profit from Their Wide Use

BY I. C. SHEPARD
New-Business Manager Southern Indiana Gas & Electric Company, Evansville, Ind.

THE central station is the logical agency for pioneering the development and application of electric refrigerators. Because of the great amount of educational work yet to be done, the necessity of proper servicing facilities and the comparatively small merchandising profit, the average electrical dealer finds it unprofitable to undertake the development of this business. On the other hand, because of its experience in pioneering other developments, its ability easily to reach the prospective customers in its territory and its facilities for servicing appliances, the central-station company is in the best position to develop this field, although the merchandising profit from sales may not cover all the cost of early development.

In view of the fact that the additional load of the electric refrigerator can be taken on with scarcely any addition to plant or distribution investment, it would seem fair to charge some portion of the cost of development of this appliance to operating expense. The experience of this company has indicated that the average energy consumption of these machines will run between 60 kw.-hr. and 100 kw.-hr. per month.

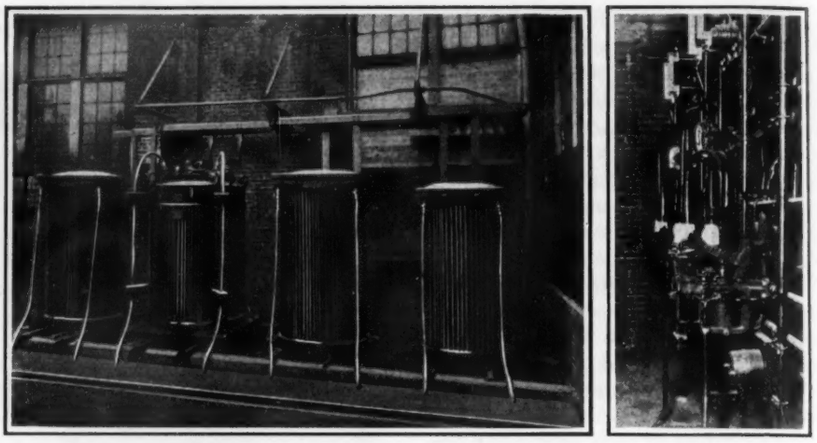
This company believes firmly in the future of the electric refriger-

ator as a practical electrical device and a valuable load builder in the residential districts. We display on our sales floor two types of machines, one a unit that can be installed in any regular-sized domestic refrigerator and the other a complete unit with box. We use newspaper space in local papers and also circularize a selected list of "prospects" and distribute material with our monthly statements. The two types of units are priced at $295 and $450 respectively and are sold on deferred payments over a period of ten months by adding a small carrying charge.

SERVICING COST REDUCED

The matter of servicing is largely one of education of customers. We have found that in many cases where trouble has been reported there was no trouble, but only a notion that something was wrong. For instance, customers reported that the machine was running longer than it should, but upon investigation it was found that the customer had made no record of the running time and had no real idea as to how long or how often the machine should operate to give proper refrigeration. We do find, however, that some inspection and attendance is necessary to keep the equipment in the best operating condition.

Motors must be well oiled and with belt-driven machines the belt must be renewed occasionally. We have found that where installations have been made properly no attention has been required for as much as six months. The average cost of servicing these machines now runs from $12 to $15 per year. However, this is caused by the comparatively small number of installations, and this cost can be cut down as the number increases and by careful training of men in more efficient methods of servicing.



LEFT—INDIVIDUAL 125-KVA. TRANSFORMERS FOR ELECTRIC FURNACES.
RIGHT—INTERIOR OF SWITCH HOUSE

Trial Operation Sells 500-Kva. Furnace Installation

AS THE result of nearly a year's satisfactory operation of a 750-lb. brass-melting furnace, the Hays Manufacturing Company at Erie, Pa., has just completed the installation of four electric brass-melting furnaces which will melt the entire requirements of its foundry. Previous to this time the greater portion of the melting was done in coke-fired pit furnaces.

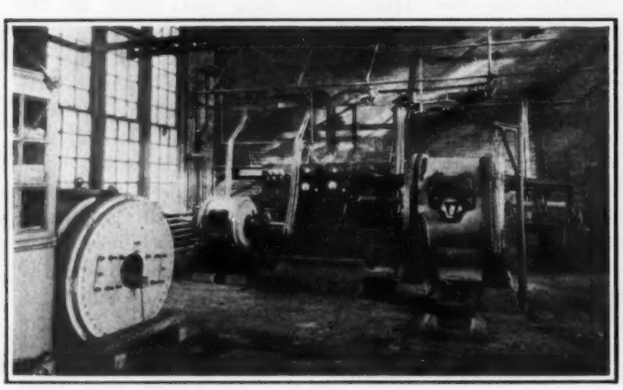
A single Detroit rocking-type electric furnace having a charging capacity of 750 lb. was installed in April, 1924, and was operated steadily for a number of months. A careful record was kept of its operating characteristics, the cost of melting and the character of the castings obtained from the electrically melted brass. The records show that the electric furnace melted brass much cheaper than did the coke-fired pit furnaces, that the working conditions in the foundry were greatly improved and that better metallurgical results were obtained.

As a result of these economical and satisfactory results three more furnaces of the same type were ordered. Two of the new furnaces have the same charging capacity as the first furnace (750 lb.) and the other has a capacity of 250 lb.

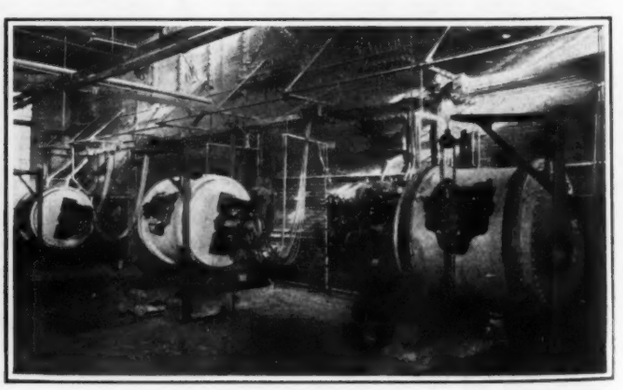
The furnaces are of the single-phase type, and each is served by an individual 125-kva. transformer. Four transformers having a total rating of 500 kva. are installed outside of the foundry adjacent to the switch house in which are the main oil circuit breaker, current and potential transformers for the power company's metering equipment and the remote-controlled oil switches for each of the furnace transformers.

Each furnace is equipped with two panels, mounted behind the furnaces as shown. One panel supports the meters used in operating the furnaces and the remote-control switch for operating the oil current breaker in the switch house. The other panel supports the automatic control for operating the electrodes.

The foundry is operating about nine hours per day. In this time an average of eight heats is obtained from the large furnaces and fifteen from the small one. Approximately 2 000 lb. of brass are melted daily.



THREE 750-LB. BRASS-MELTING FURNACES SHOWING SECONDARY BUS CONSTRUCTION



CONTROL PANELS FOR OPERATION OF FURNACES; 250-LB. UNIT IS SHOWN AT LEFT

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Burning of Liquid and Gaseous Fuels.—This is a serial report of the subcommittee on burning of liquid and gaseous fuels of the prime-movers committee of the N. E. L. A. According to this report there has been no material change in the fuel-oil situation during the past year. The use of mechanical burners is becoming more extensive, and recent installations have been made with ventilated furnace constructions in order to reduce the maintenance expense and the failures of brickwork. An interesting test is reported by the Blackstone Valley Gas & Electric Company where high rates of oil combustion were obtained. Considerable progress has been made in the burning of high-pressure gas in combination with mechanical oil burners. The results of experiments are reported by the Dallas Power & Light Company and the Peabody Engineering Corporation.—*Publication No. 24-86 of the N. E. L. A.*

Ringwood Hydro-Electric Station.—This hydro-electric station on the Avon in England is of particular interest because it operates on a fall of only 4 ft. of water. Although only two 50-hp. turbines have been installed, the constructional features are of particular interest.—*Electrical Review (England)*, Feb. 20, 1925.

Screw-Propeller Turbines at Wynau, Switzerland.—Illustrations, curves and descriptive matter are given of recently constructed turbines designed for 2,700 hp. at 107 r.p.m. to utilize an available fall of from 2.5 m. to 5.2 m. The maximum efficiencies at heads of 5.2 m., 4.7 m. and 4 m. were respectively 89, 88 and 85 per cent, the last corresponding to a specific speed (metric) of 862 r.p.m.—*Engineering (England)*, Feb. 13, 1925.

Transmission, Substations and Distribution

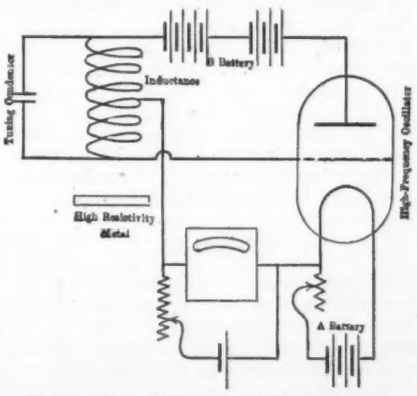
Carrier Telephony on High-Voltage Power Lines.—W. V. WOLFE.—The advent of power-line carrier-current systems offers a highly reliable and satisfactory means of communication in connection with the operation of power systems. This equipment has been designed to employ the power conductors as the transmission medium and to provide service as reliable as the power lines themselves with a low initial cost, a small maintenance charge, increased safety for the operating personnel and transmission comparable in quality and freedom from noise with that obtained on high-grade commercial toll circuits. The development of the Western Electric power line-carrier telephone system is discussed.—*Bell System Technical Journal*, Vol. IV, No. 1.

Airplanes for Inspection of Transmission Lines.—E. KNÜPFER.—The long distances covered by high-tension transmission lines and the frequently inaccessible right-of-way which they traverse make an inspection of the line very tedious on foot and next to impossible with a car. A specially designed German-made light airplane having a cruising radius of 250 miles and a motor of 50 hp. is excellently suited for this purpose. This engine gives the craft a speed of 77 miles per hour, which is not too fast to permit inspection of the line when flying about 50 yd. above it. The small plane, having a wing spread of only 30 ft., is so designed that both pilot and observer have a free view downward. The machine consumes 30 lb. of gasoline and 3 lb. of oil per hour. The landing gear has had special attention so as to permit safe landing in out-of-the-way places. — *Elektrotechnische Zeitschrift*, Feb. 19, 1925.

Units, Measurements and Instruments

Standard Requirements for Alternating-Current Watt-Hour Meters.—This is the first report of the Canadian Engineering Standards Association committee on watt-hour meters, and it applies particularly to alternating-current watt-hour meters which have no special measuring attachments, such as maximum demand, etc. The requirements set forth cover all features of alternating-current watt-hour meters on which it was found an agreement could be reached. Certain features of meter transformers are also covered.—*Report No. C 17 of Canadian Engineering Standards Association.*

Measurement of Mechanical Vibrations. — H. A. THOMAS. — The method utilizes the change in effective resistance of an oscillating circuit when the



ELECTRICAL CIRCUIT ARRANGEMENTS FOR MEASURING MECHANICAL VIBRATIONS

position of an inductively related metallic plate is varied. It is stated to be sensitive to a movement of 10^{-7} in. The electrical circuit arrangement is shown herewith, the vacuum tube generates high-frequency (about 800,000-cycle) oscillations. The effect of the presence of the high-resistivity metallic plate is to reduce the amplitude of these oscillations and therefore the mean value of the pulsating anode current. Over a certain part of its range the anode current change is linear with respect to small movements of the metallic plate. The balanced microammeter or galvanometer will therefore record the movement. The application of the device to an extensonometer for recording vibratory strains in steel members is fully described, with diagrams.—*Engineer (England)*, Jan. 23, 1925.

Generation, Control, Switching and Protection

Applications of the Fixed Orifice in Temperature Regulation.—C. L. HUBBARD. — A description is given of a method of temperature regulation in which practically all regulating valves are discarded and the entire system controlled by a single valve under the supervision of the operator. Construction details and operation of the system are given, and instructions for computing the size of the orifice, with tables and data for use in calculations, are included. — *National Engineer*, March, 1925.

Short-Circuit Currents in Large Plants.—R. RÜDENBERG.—Great destruction can be wrought in large power plants or on extended power systems by the combined mechanical and thermal effects of short circuits. As the size of generating stations is constantly growing, as is the custom of tying together a number of plants in one great system, such destructive forces would mount to values entirely beyond control if proper means were not taken to limit them to a reasonable amount. A full understanding of the cause, magnitude and character of the possible short-circuit current at various parts of the station and the network is essential to provide adequate means of curbing it. Instructive pictures are shown of the results of such forces, such as bent transformer coils, burned generator windings, damaged oil switches, collapsed substations, etc. The theory of the transient and permanent short-circuit current is investigated mathematically, and oscillograms show the differences between three-phase and single-phase short circuit and a line ground. A certain minimum of leakage flux is necessary to make a generator winding short-circuit-proof, for which the author recommends at least 12 per cent. Such a value will limit the current rush to about fifteen times normal. Large asynchronous motors with as high as 25 per cent leakage flux will limit the short-circuit current to seven times normal. For mechanical considerations the peak of the current rush is of importance, while the permanent short-circuit current, lasting frequently several seconds, determines the heating limits of the construction. The beneficial effect of current-limiting reactors is explained. Short branch feeders leading off main trunk lines should be sectionalized by reactors. Heavy short circuits on main generators can be effectively limited by a quick interruption of the excitation circuit. A special "disconnecting motor" has been developed for this purpose requiring but 2 per cent of the capacity of the main generator. Such an arrangement makes the generator current disappear in from two to three seconds. A still faster method is possible with an "oscillatory resistance" on the armature of the exciter, which

causes the excitation current to become unstable and to reverse in an extreme case. A total collapse of the alternating current in the main generator is assured from one second to two seconds with this method, as is shown in oscillograms.—*Elektrotechnik und Maschinenbau*, Feb. 1 and 8, 1925.

Operating Code Manual.—This is the serial report of the sub-committee on operating code manual of the prime movers committee of the N. E. L. A. The work of formulating the manual of operating rules as a guide to practice has been further carried out during the past year. The tentative rules cover routine, care and maintenance of boilers and boiler-plant auxiliaries and operation of the prime-mover plant.—*Publication No. 24-85 of the N. E. L. A.*

Illumination

Effect of Degree of Illumination on Letter Separators in Post Offices.—J. E. IVES.—In connection with the studies which the United States Public Health Service has been making relative to the protection and care of the eyes of industrial workers, a question has frequently arisen as to the degree of illumination that is necessary in order that work of a certain character involving the eyesight may be performed with the smallest possible strain on the eyes. An investigation has been conducted in the New York downtown post office, the details of which are given.—*Reprint No. 973 from the Public Health Reports, Washington, D. C.*

Automobile Headlighting — The content of this little booklet, written in popular style, is indicated in the foreword, which states that its aim is to present such facts in regard to automobile headlighting as will interest the motorist and to show how proper adjustment of the lighting equipment on his car can be made by following a few very simple instructions.—*Nela Booklet M-2, National Lamp Works of General Electric Company.*

Motors and Control

Development of Electric Rolling-Mill Drive.—F. ROHDE.—During the last ten years a very rapid development has taken place in Germany in the design and the general use of large motors for rolling-mill drive. Up to the end of 1914 the Siemens works had furnished a total of 600,000 kw. in these motors, which output rose to twice this amount within the next ten years. Older installations had main motors with two or even three armatures, while the present trend seems to be more toward single-rotor machines. The Ilgner flywheel motor-generator system and the Leonard method are standard. To keep the current low, direct-current main motors rated as high as 1,500 volts per motor are not uncommon. A great improvement on three-phase-driven Ilgner sets is a method to utilize the previously lost slip energy of induction motors by employing a commutator machine which feeds this energy mechanically back into the shaft of the control motor. There are at present single-rotor motors in operation with a maximum torque of 275 meter-tons and double-rotor motors with 330 meter-tons. The paper contains fifty-two illustrations of latest types of rolling-mill motors, accessories, connection diagrams and load curves.—*Elektrotechnische Zeitschrift*, Feb. 12 and 19, 1925.

Another New Self-Excited Synchronous Induction Motor.—VAL. A. FYNN.—One form of self-excited synchronous induction motor was described by the same author in a paper presented at the spring convention of the A. I. E. E., Birmingham. The present contribution describes a second form that was described before the midwinter convention of the A. I. E. E.—*Journal of A. I. E. E.*, February, 1925.

Electrophysics, Electrochemistry and Batteries

Electricity in Gases.—K. K. DARROW.—After an extensive introduction the author considers the flow of electrons through a very rarefied monatomic gas and their encounters with the atoms, the flow of electrons across dense air, nitrogen, hydrogen and similar gases, characteristics of the electron stream flow, space-charge equations and self-maintaining discharges.—*Bell System Technical Journal*, Vol. IV., No. 1.

Electronic Bombardment of Metal Surfaces. — H. E. FARNSWORTH. — A study has been made of secondary electron emission from Cu, Ag, Au, Pt, Pd, Mg and Al, produced by electronic bombardment. Curves are given showing the ratio of secondary (emergent) to primary (incident) electron current as a function of the primary velocity. —*Physical Review*, January, 1925.

Study of Various Insulating Materials for Submarine Cables.—The Bureau of Standards has been investigating the properties of materials which can be used for insulating submarine cables. At the present time practically all cables are insulated with gutta percha. Recently the bureau has insulated some wire with hard rubber, and from the measured properties it appears that this substance would be a more satisfactory material for insulating submarine cables than gutta percha. The work that is being done in this respect is described.—*Technical News Bulletin No. 94 of the Bureau of Standards.*

Traction

Census Report Shows Status of Electric Railways.—Tables and other statistics from the recent census report are quoted and briefly analyzed.—*Electric Railway Journal*, Feb. 21, 1925.

High-Voltage Mercury-Arc Rectifiers.—C. BRYNHILDSEN.—A Swiss concern has developed a special line of mercury-arc rectifiers which are particularly suited for the supply of high-voltage direct current to railroads. These machines operate much more economically for high direct-current potentials because the percentage of losses becomes smaller and the possible maximum output of a given type can be increased proportionally to the voltage. For more than 1,500 volts these rectifiers stand without competition, and there are plants in operation supplying direct current at a voltage as high as 4,000—in Italy, for example. The vacuum pump for these sets consumes 300 watts for the first stage and 500 watts for the second or diffusion stage. To avoid the danger of grounding, the water cooling is operated as a self-maintained circulating system, with pump and radiators fully insulated from ground. The most satisfactory method of starting these sets was found to be an electromagnetically operated auxiliary anode, insuring a safe start within a few seconds, consuming 3 amp. in the solenoid and 5 amp. in the auxiliary arc. One firm has at present about sixty-five of these high-voltage rectifiers in operation, with capacities ranging between 250 kw. and 800 kw., and voltages from 1,100 to 4,000 — *Brown-Boveri Mitteilungen*, February, 1925.

Telegraphy, Telephony, Radio and Signals

Telephone Transmission Standards.—Dr. F. BREISIG. — *Telephone Transmission Units.* — Col. T. F. PURVES. — The first of these articles is an argument for the adoption of the "natural" system of units in rating telephone circuits, that is, rating them directly in terms of the attenuation factor βl. The author's point is that the "transmission unit" is an arbitrary quantity, convenient enough when circuits consisted essentially of actual aërial lines or cables, but lacking in basic significance and not adapted to theoretical treatment. The second article takes the opposite view, holding that while the attenuation factor is used for theoretical investigation, the *TU* is better suited to the needs of the practical engineer.—*Electrician (England)*, Jan. 30 and Feb. 6, 1925.

Recent Investigations on the Propagation of Electromagnetic Waves.—M. BAEUMLER.—Since the summer of 1922 quantitative measurements have been carried out at two German stations on the signal strengths of high-power American stations. An objective method was used, and the measured field intensities were compared with theoretical values computed from the known input at the sending stations, ignoring absorption. Curves are presented showing field strengths throughout certain days and nights. In view of the agreement of calculated values and those actually found at night it is concluded that the night value is to be regarded as the normal one and the day value as the abnormal or disturbed one. An explanation of the day-time diminution is given by assuming that the atmosphere is "electrically turbid" by day in consequence of the heating of the earth and the resulting vertical motion of masses of heated air. The waves are refracted, absorbed or reflected (and hence weakened) at the boundary surfaces of air masses of different densities. The derivation of a universally applicable formula giving the field strength, while taking account of all absorption losses, is regarded as impossible at present. The emperically determined absorption factor of the Austin-Cohen formula gives results markedly below those found by measurement, while the factor found by L. F. Fuller gives values in good agreement.—*Proceedings of the Institute of Radio Engineers*, February, 1925.

News of the Industry

Merrill and Kelly to Quit

Secretary of Federal Power Board Discouraged by Small Pay and by Congress

APPARENTLY the small salary increases which were allowed the technical men in the government service by the reclassification act are doing little to check the rapid turnover of this class of government worker.

The electrical industry, it is understood, is about to absorb Colonel William Kelly, chief engineer of the Federal Power Commission. The salary of his rank is $7,200, which includes commutation of quarters and other army perquisites. It is said that the Niagara Falls Power Company thinks he is worth three times that amount to it. The plan is, it is understood, to make him a vice-president of the company with duties largely confined to the engineering side of its operations.

O. C. Merrill, the executive secretary of the Federal Power Commission, has announced that he also expects to leave the government service in the near future, after sixteen years of public service during which he has been the outstanding representative of the public's equity in water-power resources. Mr. Merrill makes no effort to conceal the fact that he feels Congress has shown little appreciation for the many years he and others have devoted to the problems involved in establishing the federal water-power policy and to other matters pertaining to the administration of water-power resources.

Low Salary Not Only Grievance

It is not a matter of salary alone with Mr. Merrill, although he is in the anomalous position of receiving only $6,000 annually as compared with the $7,200 paid the chief engineer of the commission and the $7,500 paid its chief accountant. Besides this irritation, due to the parsimony of Congress, the administration of the act has been made cumbersome and difficult because of the requirement of operating with personnel borrowed from the War, Interior and Agricultural departments. Congress has paid no attention to Mr. Merrill's requests for legislation authorizing the commission to hire its own help. The water-power act provides that engineering and economic studies be made with the returns from licenses, but the enabling legislation has not been forthcoming and the money has been going into the Treasury as miscellaneous receipts. The requirements of the law with regard to plant valuations cannot be carried out because of inability to secure personnel capable of doing the work. Pre-license expenditures and other accounts cannot be checked properly because of lack of accountants.

It is admitted generally that Mr. Merrill is an asset to the government that it will be most difficult to replace, but Congress has held another session and has emphasized anew its ingratitude. Before it meets again Mr. Merrill probably will have found a place where his services are more appreciated.

While many industries are benefiting from their ability to attract such men from the government service, the question is being asked whether it is fair to the taxpayer to allow the continuance of the large turnover of technical employees. The experience and training they have received in the government service constitute an important asset which the public loses when the employee quits. Some private enterprise, in turn, realizes on this asset, which, in a way, constitutes a subsidy to that particular company. That the administration is taking cognizance of the situation is indicated by recent expressions from two members of the Cabinet.

Canadian Export Tax Widely Discussed

Buffalo Company May Make Fight Against Duty—Controversy Aroused in Canada, Where Doubt as to the Incidence of the Tax Is Expressed

THE imposition of an export duty on electrical energy produced in Canada of 0.03 cent per kilowatt-hour, or $1.95 per horsepower-year, as announced by the Minister of Finance in presenting his 1925 budget in the House of Commons, on March 24, has given rise to considerable discussion and speculation in the United States. This is true also of the Dominion, especially in Ontario.

Concern Felt in Buffalo

A large part of the electric power distributed by the Buffalo General Electric Company comes from the Canadian Niagara Power Company, and whatever tax is levied will, it is assumed, mean an increase in rates of exactly the amount of the charge—the tax will be passed along directly to the ultimate consumer.

"This is a most serious matter," William R. Huntley, vice-president of the company, declared. "Naturally, we are contemplating making the best fight we know how to protect the consumer. If there is any way we can prevent this tax or stop it, we are going to try to find that way. It will be a matter between the two governments—at Washington and at Ottawa."

The American companies are expected to fight the tax not only for the immediate protection of their customers, but also on the theory that it is merely the beginning of a plan to tax the American consumers of imported energy and that the tariff will be constantly increased.

Criticism in Canada

That the action of the Canadian government is ill-considered is the opinion of Sir Henry Drayton, former Minister of Finance. Addressing the House on this subject, following the budget announcement, he expressed himself as "utterly and unalterably opposed to the further export of any electrical power from Canada." "In most of the consuming centers of the United States," he said, "$36 per year per horsepower is considered fairly cheap, while the charge here is a mere fraction of that amount. Our rate could be doubled, trebled and quadrupled, and it would still pay the Americans in most instances to take power on that basis. But I am afraid the government is preparing the way for an excuse which will enable it to consent to the export of power in large quantities.

"The Hydro-Electric Power Commission of Ontario," Sir Henry continued, "was obliged to enter into a contract with the American corporation that owned and controlled the development of the Niagara River on the Canadian side, and which controlled the distribution of the system on the other side of the river, whereby it agreed to supply the power at a very low rate. The rates in those days were absurdly low as compared with those that are now charged, and the mere fact that the Hydro commission today has to supply power at those rates means a tremendous loss to it, a loss ranging probably from $120,000 to $180,000 a year, handling the power wholesale, and much more than that at retail."

C. Alfred Maguire, who is president of the Ontario Municipal Electric Association, fears that the tax will fall on the Hydro system's consumers in Ontario. "There is no provision at all in the various long-term contracts for protection of the public of Ontario," he said. "Under the proposed tax the people of Ontario would have to pay about $170,000."

In commenting on the export tax, J. R. Cooke, member of the Ontario Hydro-Electric Power Commission, said he thought the duty would have little effect on the Ontario Hydro. "The commission has never exported power from development plants which it erected itself," he said. "However, there is an export of 60,000 hp. from the Ontario Power Company plant at Niagara, which was purchased by the Hydro. When the Hydro bought this plant, this export of power was under franchise until 2010, but the Hydro managed to get it reduced to 1950."

The Toronto *Globe*, in its editorial

columns, said: "A federal export duty on hydro-electric energy is an innovation which is certain to be controversial. . . . No doubt it will be a simple matter for the federal authorities to collect the tax from the exporting companies, but will the latter be in a position to collect it from their United States customers? The answer to the question is especially important to Ontario, as two publicly owned concerns, the Ontario Power Company and the Toronto Power Company—units in the Niagara system of the Ontario Hydro-Electric Power Commission—are among the heaviest exporters."

J. S. Norris, vice-president and general manager of the Montreal Light, Heat & Power Company, said: "The tax will certainly, I should think, have the effect of discouraging Americans from tampering with Canada's natural resources." The imposition of the tax on the exportation of power, he explained, meant that $40 more capitalization was required for every horsepower developed for export purposes on a basis of 5 per cent.

Plant with 2,400-Ft. Head

San Joaquin Light & Power Will Build 28,500-Kw. Station in Kings River Canyon

WORK will be started immediately by the San Joaquin Light & Power Corporation, Fresno, Cal., on the Balch plant of its Kings River hydro-electric development. The initial installation will consist of a stream-flow plant containing a 28,250-kw. generator driven by double-overhung impulse waterwheels. The effective head will be 2,400 ft., giving this plant a higher head than any other hydro-electric installation on the North American Continent. The work will cost about $5,000,000, and the plant is to be ready for operation by January 1, 1927.

KINGS RIVER CANYON, SHOWING LOCATION OF BALCH POWER HOUSE AND PENSTOCK

A road has been completed to the power-house site and the preliminary engineering work has already been done. A simple concrete dam will divert the water through an unlined tunnel 19,600 ft. long and 12 ft. x 12 ft. in dimensions. A single penstock, branching at the lower end for the two wheels, will convey the water from a surge chamber to the plant. The penstock will be 4,725 ft. in length, 58 in. in diameter at the top and 26 in. at the bottom. It will be of welded steel 1⅛ in. thick at the lower end and taper down to a thickness of ⅜ in. at the top. Up to a thickness of ¾ in. riveted steel will be used. Transmission will be at 110 kv. for a distance of 39 miles to Sanger substation, near Fresno. Twenty-two miles of this line is completed.

The Balch power house will ultimately contain six units similar to the first, with a total capacity of 146,000 kw. The Kings River project has 500,000 potential horsepower, for the progressive development of which a tentative scheme has been mapped out.

Muscle Shoals Commission Appointed

President Selects Former Representative McKenzie, Former Senator Dial, Professor Curtis of Yale, William McClellan and R. F. Bower as Members

DETERMINING to appoint five men instead of three to the Muscle Shoals investigating commission sanctioned by the late Congress, President Coolidge on Friday, March 27, named the following:

John C. McKenzie, a former member of Congress from Illinois.

Nathaniel B. Dial, formerly a senator from South Carolina.

Harry A. Curtis, professor of chemical engineering at Yale University.

William McClellan, of McClellan & Junkersfeld, consulting engineers, New York.

Russell F. Bower, of the American Farm Bureau Federation.

It was stated at the White House that the members of the commission will receive compensation and that they will be expected to consult with the Secretaries of War, Agriculture and Commerce. Their duty is expressed by the President as being "to examine into and report to him upon the most practical method or methods of utilizing to the best advantage the Muscle Shoals facilities."

Former Representative McKenzie was a member of the House committee on military affairs, and last year he prepared the bill favored by the majority of that committee to accept the offer of Henry Ford for the exploitation of Muscle Shoals. He was not a candidate for re-election. Ex-Senator Dial, defeated for renomination at the hands of his party, has been especially interested in Muscle Shoals from the point of view of fertilizer manufacture. Professor Curtis was consultant to the Department of Agriculture in the reorganization of its fertilizer work and was at one time executive officer of the nitrogen research office under the United States Army. He directed the recent world nitrogen survey of the Department of Commerce. Mr. McClellan, a former president of the American Institute of Electrical Engineers, is a prominent member of his profession. A biographical sketch of him will be found under "Men of the Industry." Mr. Bower has been engaged for some time with the American Farm Bureau Federation in the study of Muscle Shoals problems, particularly in their relationship to agriculture.

SECRETARY WEEKS' PLANS

The War Department in the near future will advertise for bids for the lease of power at Muscle Shoals pending definite disposition of this power by Congress. In response to a question from the Washington correspondent of the ELECTRICAL WORLD, Secretary Weeks revealed on March 30 that he would sell all of the available power on a short-time lease, which, however, would be revocable at any time on thirty days' notice. Whether the nominal period of the lease would be for six months, a year or eighteen months would be a matter of negotiation, he said. Because of the uncertainty surrounding the action Congress may take, Secretary Weeks expressed the opinion that no company probably would feel justified in incurring any great amount of expense in transmission-line construction to get power on this temporary basis. Colonel Spaulding, in charge of construction at Muscle Shoals, has been called to Washington to participate in the preparation of the leases.

Secretary Weeks' plans may, however, be postponed by a statement from the White House to the effect that while the President favors the utilization of the power at Muscle Shoals under temporary leases, he believes it would be wise in that connection to consult the commission which he has just named. The President wants to be absolutely sure that the sale of the power, pending action by Congress, will not interfere with the final disposition of the properties—the loss from failure to realize on the power immediately would, in his opinion, be preferable, it was indicated.

VIEWS ON COMMISSION

The disappointment very generally felt because a more outstanding commission was not selected is tempered somewhat by the recognition that it is certain to be opposed to government operation. Apparently Senator Dial is going to hold the balance of power on several important issues as the other members are likely to be equally divided. From the known views of members of the commission it would seem to be safe to say that a majority will be in favor of the immediate construction of Dam No. 3 and further development of the upper Tennessee.

All the members except Mr. McClellan are especially interested in fertilizer production. A view certain to be presented by one of the members, however, is that no manufacturer of fertilizer east of the Mississippi River can afford to use electric power for that purpose. Within a few years, if not now, that commissioner believes, electricity will be worth so much more for other purposes that the fertilizer manufacturer will not be able to compete. Evidence is accumulating so rapidly that power is going to be an unimportant factor in the fixation of nitrogen that it is certain to have an important bearing on the recommendations of the commission and on the action of Congress.

Conowingo Cost Estimates Not Shaken

Stone & Webster Maintain Their Figure of $52,200,000—Stotesbury Gives Brief History of Undertaking—Contractors' and Engineers' Fees

HEARINGS on the plans of the Susquehanna Power Company and the Philadelphia Electric Company anent the projected hydro-electric development at Conowingo, Md., took place before the Pennsylvania Public Service Commission at Philadelphia on Friday and Saturday of last week. The Maryland Public Service Commission sat with the Pennsylvania body, and the Federal Power Commission was represented by its executive secretary, O. C. Merrill.

Edward T. Stotesbury, senior partner in the banking firm of Drexel & Company, was a main witness on Friday. He defended the part played by his firm in the project, giving a history of Drexel & Company's connection with it and saying in part:

Stotesbury's Testimony

"Ten or twelve years ago Bertron, Griscom & Company, representing the owners of the Susquehanna water-power rights, asked Drexel & Company to take an interest in the development and financing of the Conowingo project, but we did not believe the time was ripe to proceed. After the period of financial readjustment following the war, Bertron, Griscom & Company endeavored unsuccessfully to sell the project to the Philadelphia Electric Company, which decided against taking it over and developing it. Following this action Drexel & Company opened negotiations with Bertron, Griscom & Company and obtained an option which was free from the conditions contained in the proposition presented to the Philadelphia Electric Company under which the United Gas & Electric Company had a call on a fourth of all the power produced.

"Drexel & Company then proceeded to have made further comprehensive engineering and legal studies of the whole project as a necessary preliminary to working out a plan for financing and were supplied with engineering data previously collected by the Philadelphia Electric Company. Stone & Webster were employed to make the engineering studies and to prepare a detailed report of the possibilities of the enterprise. When we learned that Stone & Webster's report was favorable, we notified the Philadelphia Electric Company, and in January, 1924, we furnished it with a copy of the complete report, which was then checked and substantially concurred in by its engineers. As a result the Philadelphia Electric Company notified us that it wanted to take all the Conowingo power provided it could fully control the operation of the hydro property. Consequently we discontinued our negotiations to dispose of the power to others. After various conferences with Philadelphia Electric Company officials, it was agreed that we should receive $1,170,000 as our own compensation, only a little more than 1¾ per cent of the present estimated investment required to bring the water power to Philadelphia. This sum is independent of our participation in the syndicate which we expect to organize to distribute the bonds. No one else has any interest whatever in the compensation payable to us."

Mr. Stotesbury also testified that J. E. Aldred, president of the Pennsylvania Water & Power Company and chairman of the board of the Consolidated Gas, Electric Light & Power Company of Baltimore, had offered in 1923 to finance half of the Conowingo project in return for half of the power. Mr. Stotesbury was cross-examined by Ellis Ames Ballard, attorney for the Philadelphia Rapid Transit Company, but his testimony was not weakened.

Charles W. Kellogg, engineer with Stone & Webster, stuck to the estimate of $52,220,000 as the total cost of the project to the Philadelphia Electric Company. He estimated that on 1,150,000,000 kw.-hr. to be delivered at Philadelphia in 1930 there will be a saving of $779,000 as compared with the cost of the same amount of energy produced by steam. He asserted that the contractors' fee would be $1,325,000, or 4.92 per cent of the cost of the dam, power plant and tailrace. The bill for the firm's preliminary services—$150,000—would, he said, be sent to Drexel & Company. Mr. Kellogg said the estimate of saving by means of hydro-electric power was based on a normal flow and that it would be possible to get an output of 1,280,000,000 kw.-hr. at Conowingo.

Colonel Hogan in Rebuttal

On Saturday the Philadelphia Rapid Transit Company presented Colonel John P. Hogan, a hydraulic engineer of New York, as a witness to prove the unsoundness of the previous evidence. Mr. Hogan admitted that he was asked on March 4 to investigate the project and that he gave a "very preliminary opinion" on March 6. He said he was not in possession of sufficient facts to testify under oath.

Colonel Hogan, in referring to the Conowingo report, said that there were "errors of assumption" in the preparation of the estimates and that the Conowingo project would show a yearly loss rather than a yearly profit. He said that if conditions in the three years following the opening of the plant are the same as they were in the three years 1908, 1909 and 1910 there would be a total loss to the Philadelphia Electric Company of about $7,500,000. The probable loss in a single dry year, he further stated, would be about $2,550,000.

W. C. L. Eglin, vice-president of the Philadelphia Electric Company, asserted that the plant would give 300,000 consumers in the Philadelphia district the advantages of hydro-electric power, and that it would release each year for other purposes about 750,000 tons of coal. It will also tend to develop natural resources that are now going to waste, he said.

Mr. Eglin was questioned with regard to the fee of $380,000 that was said to be payable to him in the event that the Conowingo project was accomplished. "Who is the owner of this account of $380,000?" asked Mr. Ballard. "The Philadelphia Electric Company," replied Mr. Eglin. His name, he said, had been used in connection with this sum merely as a "vehicle." Mr. Eglin added that he and other members of the company's engineering staff had done some special work, "for which we may be compensated or we may not."

During the hearing the fact was mentioned that Governor Ritchie of Maryland has asked for the reservation of 25 per cent of the power produced by the plant for the State of Maryland.

Merrill Discusses Maryland's Rights to Conowingo

For Maryland to reserve the right to recall power exported from the state in connection with the proposed development at Conowingo on the Susquehanna River probably would have the effect of preventing the development of the project by those now proposing to undertake it, in the opinion of O. C. Merrill, the executive secretary of the Federal Power Commission.

"The Conowingo project," Mr. Merrill says, "is one that can be built economically only if it is to develop a far greater proportion of secondary power than is customary. It is proposed to make an initial installation of 280,000 hp., although the primary power is less than 50,000 hp. Such a large proportion of secondary power can be used only in a market which has steam capacity at least equal to this secondary power. Steam and hydro installations must be adjusted so as to supplement each other. If those who propose to develop the project must look forward to losing all of the primary power—for that is the only power which would be suitable for withdrawal for independent service in Maryland—it is doubtful if the project would be worth developing. If the Maryland corporations concerned in the development are required to render service in the territory where they now have charter rights, that is all, in my opinion, they could afford to do without jeopardizing the undertaking.

"I assume that the State of Maryland has authority to fix the contract price between a wholesaling company and a distributing company if both are corporations of the state. I assume also that Maryland has authority to regulate the rates and services of the distributing company. As to its authority to fix the contract price when power is wholesaled to a domestic distributing company by a foreign corporation from sources outside the state, I have grave doubts. Such a situation exists in the purchase of power by a Baltimore distributing company from the Holtwood project in Pennsylvania. I know of no cases where these questions with respect to interstate power transmission have been decided definitely, but analogous cases of interstate wholesaling of natural gas cast considerable doubt on the exercise of such power by the states.

"It happens in the Conowingo case that the companies were required to

take out a federal license. One of the conditions imposed as a prerequisite to approval was that the proposed contract should be revised so as to provide specifically that the contract rate is to be subject to revision, either by the State of Pennsylvania, the State of Maryland or the Federal commission, whichever may be found to have jurisdiction over the interstate sale."

Philadelphia Transit Seeks Electric Proxies

An extraordinary attack by one public utility company upon another is being made by the Philadelphia Rapid Transit Company upon the Philadelphia Electric Company as part of the former company's attempt to discredit the Conowingo hydro-electric project. In the "service talks" which it distributes to the public the railway company is urging the stockholders of the electric company to give their proxies to its legal representatives, and it promises that if sufficient proxies are received to permit the Philadelphia Rapid Transit to elect directors at the electric company's annual meeting on April 8 the annual dividend rate on Philadelphia Electric common stock will be increased from 8 to 10 per cent. The statement says that the "P. R. T. management's sole interest in P. E. lies in preventing the uneconomic Conowingo project being imposed upon P. E. stockholders, P. E. customers and P. R. T. car riders for bankers' profit."

Street cars of the traction company are placarded with signs advising the public to read the company bulletins and learn the truth about the fight being made on the bankers who control the electric company, and several hundred traction employees have been put to work soliciting the desired proxies.

The Philadelphia Electric Company replied to the attack in full-page advertisements in the newspapers. These advertisements assert that the electric company has reduced power rates $3,600,000 and paid 10 per cent dividends in the last three years, while the traction company, under the Mitten management, has increased rates 18 per cent and cost the city $7,000,000. The Philadelphia Electric Company has 30,000 stockholders among 360,000 customers.

A statement by the Rapid Transit Company that J. B. McCall, former president of the Philadelphia Electric, was forced into retirement was branded by the latter company as an "unqualified falsehood." The result of the Mitten drive for proxies will be known next Wednesday.

Franchise with New Rate Plan Opposed in Denver

A new plan of rate making is embodied in the tentative draft of the proposed twenty-year renewal franchise of the Public Service Company of Colorado, which has been presented to city officials preparatory to submission to the voters on May 19. The rates proposed embody a reduction of 5 per cent in electric rates and 10 per cent in gas rates and will save customers $350,000 annually. It is proposed that rate changes in the future be governed by the cost accounting standard of the federal Department of Labor, whereby a barometer of rates is created by striking an average between all necessities of life and the salaries of paid wage earners. The reduction now proposed would therefore be merely a base price and could be raised or lowered yearly thereafter by the company under the terms of the franchise.

Opposition to the proposed franchise has been voiced by a number of civic organizations in Denver, including the special committee appointed by the Chamber of Commerce, on the ground that sufficient time has not been permitted by the company for a thorough study of the franchise provisions. More than 15,000 names have, however, already been obtained by representatives of the company in favor of the early submission, though only 4,000 are necessary, and an active educational program is being carried on. The company is unwilling to recede from its position, although its existing franchise does not expire until June, 1926.

Los Angeles Wants to Revoke Commission Control

The City Council of Los Angeles has passed a resolution calling upon other cities and towns in California to cooperate in presenting to the Legislature such measures as will allow the people of the state, including cities and towns, to set the rates to be charged for gas, water, electricity and telephones. This movement is to restore control of public utilities to city governing bodies, where it rested before a constitutional amendment conferred it upon the State Railroad Commission. The resolution alleges that the commission has raised the rates of public utilities to an oppressive extent, as evidenced by general dissatisfaction over a rate increase granted to the Southern California Telephone Company recently.

I. E. C. Advisory Committees' Hague Program

Meeting at The Hague, Holland, from April 16 to April 23, the advisory committees of the International Electrotechnical Commission will, according to the preliminary program just completed, discuss traction motors, standard pressures, prime movers, transformer oil, lamp caps, as well as symbols, ratings, rules and regulations, nomenclature and, if required, terminal markings. Papers will be presented on traction motors and transformer oil. This program is, however, subject to revision.

Meeting at the A. I. E. E. headquarters on March 25, the United States National Committee of the I. E. C., after listening to a comprehensive analysis of the subjects scheduled and others from its guidance-of-work committee, gave specific instructions to the American delegates where these were possible, and where not possible supplied them with data representing the best thought of the United States on the subjects to be reviewed at The Hague.

These delegates will represent the United States: Dr. C. H. Sharp, president of the United States National Committee; Dr. C. O. Mailloux, honorary president of the I. E. C. and of the United States National Committee; C. E. Skinner, Westinghouse Electric & Manufacturing Company; L. L. Elden, Edison Electric Illuminating Company of Boston; S. E. Doane, chief engineer National Lamp Works, Nela Park, Cleveland; E. A. Snyder, General Electric Company, Pittsfield, Mass., and one representative each of the Electric Power Club and the telephone interests, to be designated.

Governor Smith Favors Tri-State Transmission Treaty

In a message sent to the New York State Legislature in its closing hours last week Governor Smith went on record as favoring a tri-state treaty between New York, Pennsylvania and New Jersey governing the interstate transmission of electricity and aimed to keep it from federal jurisdiction. He will bring the matter up at the next session. The Wales-Hutchinson bill, noted last week, to regulate "interstate and foreign transmission and delivery of electric current" passed the Senate but failed to reach a vote in the Assembly.

A bill permitting the sale of power generated on the Barge Canal at Crescent Dam and Vischers Ferry to be disposed of to others besides municipalities—the cities in the district being unable to use it—was passed; but a law to make impossible the free use of water from certain points on the canal by manufacturers to generate power—an abuse unearthed last winter—failed. It is understood, however, that the State Engineer will take vigorous steps to have these diversions checked and will ask the Water Power Commission of the state to recover rentals.

Spirited Contest for Territory in New York State

The contest of the St. Lawrence Transmission Company (now the St. Lawrence Valley Power Corporation) and the Oswegatchie Light & Power Company for control of the electric lighting business in the town of Governeur, St. Lawrence County, N. Y., came to a head before the Public Service Commission this week when hearing was had on the petitions of both companies for approval of the exercise of franchises along a number of specified highways. Intercompany negotiations have failed, and the companies ask the commission to reach a determination as to what territory each shall serve. Both companies have extended their operations into the town of Gouverneur, although neither had the legal right to do so without obtaining the approval of the commission to the franchises granted by the town boards.

Following the hearing it was agreed that Commissioner Charles Van Voorhis, who heard the case, should hold a conference with F. A. Stoughton, president of the St. Lawrence company, and Michael Doyle, president of the Oswegatchie company, at Albany, in an effort to reach an agreement.

To Vote on Milwaukee Plan

Contract Goes to People on Tuesday Next—Engineers' Society Opposes It

UNCONDITIONAL rejection by the voters at the polls on Tuesday next, April 7, of the proposed service-at-cost contract between the city of Milwaukee and the Milwaukee Electric Railway & Light Company (see ELECTRICAL WORLD for October 4, 1924, page 754) was urgently recommended in resolution and report by the Engineers' Society of Milwaukee following a stormy three-hour discussion of the plan by the membership during a special meeting on March 23. The vote was forty-two to twenty-eight against the plan. The report prepared by a special committee of the society after a three months' study said that the contract is the first step toward ultimate municipal ownership and is an excuse for forcing up the rates of fare instead of bringing them down, and the resolution adopted declared that "a question of such importance as that of public ownership should be put before the voters openly, frankly and without disguise."

Egbert Douglas, consulting engineer and a member of the investigating committee, declared that all the contract does is swap three commissioners at Madison for one in Milwaukee. S. J. Gates, who championed the contract, pointed out that the city is in no position to purchase the properties because it is already within $2,000,000 of its bonded debt limit.

The last obstacle to the company's participation in the plan was removed when over 200 stockholders of the company met in Milwaukee last week and ratified the contract. The Wisconsin Railroad Commission has also placed its stamp of approval on the proposed contract. It declares that the value of the company's properties as fixed is just, as is the method provided for ascertaining the value in the future. The commission also found that the rates allowed are reasonable.

Characterizing the report approved by the Engineers' Society as incomplete, inaccurate and misleading, fourteen engineers and members of the society and affiliated societies have issued a signed statement protesting against it.

Depew (N. Y.) Company Is Acquired by White Interests

ACQUISITION of the Depew & Lancaster Light, Power & Conduit Company, serving a territory of approximately 80,000 population on the outskirts of Buffalo, is formally announced by the Associated Gas & Electric Company, holding concern for the J. G. White properties. Under a thirty-year contract with the Niagara, Lockport & Ontario Power Company, the Depew & Lancaster receives hydro-electric energy generated at Niagara Falls for distribution to its customers. Along the Canadian border in New York State the Associated Gas & Electric has acquired three small properties which it plans to merge into one corporation to be known as the Champlain Electric Company. These properties serve approximately 5,000 population. They will be physically interconnected and generate power from their own plants. The interconnection plans of the Associated Gas & Electric Company, in which its Ithaca subsidiary, the New York State Gas & Electric Corporation, plays a chief part, and its budget of early expenditure on various properties have both been already noted in the ELECTRICAL WORLD (February 21, page 425, and March 28, page 684).

Announcement has also been made by the Associated Gas & Electric Company that it hopes some time this year to interconnect its properties at Portsmouth, N. H., and vicinity with those of the Middlesex Power & Light Company property operating in north central Massachusetts. This interconnection will permit the supplying of large blocks of power to several industries in the territory served by the Middlesex company which cannot be taken on the lines at present.

The company recently purchased several small municipal electric stations lying midway between its Kentucky and Tennessee properties which will be connected to the plant at Martin, Tenn. This line will be extended later to connect with the large generating plant at Hopkinsville, Ky., the generating capacity of which is being substantially increased with the object of supplying the entire requirements of the Kentucky and Tennessee properties. The decision to enlarge the Hopkinsville plant is based on the fact that it lies close to the Kentucky coal fields and permits of cheap fuel costs.

Chicago's Street-Lighting Program

City Has Installed 6,500 New Units and Has Ordered as Many More—Satisfaction Is Expressed from Both Utilitarian and Ornamental Viewpoint

CHICAGO has embarked on one of the most extensive programs of modern residential street-lighting improvement ever undertaken by any municipality. Since last summer it has installed 6,500 new lighting units as a part of the comprehensive plan, and they have proved so satisfactory that it has ordered 6,500 more. The benefits as reported by representative citizens are not merely safer and more convenient travel for both vehicles and pedestrians and enhanced appearance of the streets, but a feeling of greater security with respect to life and property and increased real estate values.

On August 1 of last year the city began supplementing electric lamps served from aërial circuits and gas and gasoline lighting units in the residential sections with modern electric lighting units installed on concrete standards. So rapidly did the work proceed that by March 1 of this year approximately 6,500 of the new units, covering an area of 11 square miles of city territory and 220 miles of streets, had been installed and were in operation. This work was done at a cost of about $1,600,000.

During the present year it is expected that $2,000,000 more will be devoted to continuing the work of improving Chicago's street lighting. Several plans of procedure are up for consideration. One involves revision of the 19,000 existing 6.6-amp. ball-globe units, of which there are approximately nine to the block. Another involves installing 250-cp. lamps in ripple-glass globes, five to the block, giving approximately 40 per cent more illumination per block than the old units with approximately 47½ per cent fewer units and consequently less maintenance expense. If the latter plan meets approval, 9,000 more units can be installed in place of 6,500 revamped units.

LIGHTING UNIT CHOSEN

The lighting unit employed, which was chosen after a careful investigation of different types and after various cities had been visited, is a General Electric "Novalux" unit of a special form for this installation, known as the Chicago type. It is equipped with a 250-cp. incandescent lamp in a rippled-glass globe. The unit is similar to the standard "Novalux" type, but the bottom of the globe has greater curvature. The top canopy is an aluminum spinning of natural finish and is designed to support possible future improvements in the form of reflectors or refractors that may become economically available. The use of this type of fixture will permit the renewing of lamps and testing for trouble by simply removing the canopy. Since the globes need not be disturbed, it is expected that the breakage of glass will be decreased.

Concrete standards, designed by the Chicago Department of Gas and Electricity, are being employed. They are 10 ft. 9 in. high and 18 in. wide at the base and are cast separate from the foundation to which they are bolted. The standards are installed in a staggered arrangement at approximate intervals of 150 ft. The center of the foundation is placed 36 in. from the inside edge of the curb to minimize the possibility of injury from motor vehicles. The mounting height of the light source is 12 ft. The lamps are so arranged that each end of each alley is lighted by one unit, since alleys are used extensively in Chicago residential blocks for the removal of ashes, garbage, etc., and for the entrance of tenants to garages.

Installation and construction have and are being conducted both by contract and the city's day-labor forces—approximately 2,400 lamps by the former and 4,100 by the latter.

The cost of installing the new system is equivalent to 80 cents per front foot and the operating cost is 11 cents per front foot, as compared with an installation cost of $1.10 and an operating cost of 22½ cents per front foot for the last previous installation. The expense is borne by the city at large and not by the individual property owners affected. Real estate owners and dealers

say that property values have been increased by the improvement. The police pronounce the new lights a deterrent to crime, and John T. Miller, Commissioner of Gas and Electricity, under whose supervision the work was undertaken and is being carried on, has received many letters from citizens who say that they feel the security of lives and property has been greatly promoted.

South Boasts 2,000,000 Hp.

And Expects Soon to Add Approximately 1,000,000 Hp. More of Electrical Capacity

COMPLETION of power plants during 1924 added 210,400 hp. to the hydro-electric and other power systems of the South, according to figures just compiled by the G. L. Miller Company of Atlanta. Other projects were put under construction during the year which will add 726,850 hp. upon their completion, thus raising the grand total of electrical energy in the South for industrial and commercial purposes to nearly 3,000,000 hp.

Among the plants brought in or put under construction during the year were

	Hp.
Southern Power Company.....	705,000
Georgia Railway & Power Company	330,300
Columbus Electric & Power Co...	82,000
Central Georgia Power Co.....	28,000
Georgia-Carolina Power Co.....	23,500
Alabama Power Company.....	525,680
Tennessee Electric Power Co.....	275,700
Total	1,970,180

the Tiger steam plant of the Southern Power Company at Duncan, S. C., costing $2,000,000 and generating 40,000 hp.; the third unit of the Warrior steam plant of the Alabama Power Company, with 30,000 hp.; the Hales Bar plant at Chattanooga, and the Great Falls hydro-electric plant at Rock Island, Tenn., both brought in by the Tennessee Electric Power Company and costing $4,150,000; the Remmel plant of the Arkansas Light & Power Company, near Hot Springs, costing $1,750,000 and developing 25,000 hp., and the El Dorado station of the same company, developing 1,300 hp.

Principal projects started during 1924 in the South include two new hydro-electric stations for the Southern Power Company—one at Rhodhiss, N. C., and the other on the Catawba, S. C.—the first generating 45,000 hp. and costing $4,500,000 and the second developing 80,000 hp.; the Mathis and Yonah stations of the Georgia Railway & Power Company, developing together 67,500 hp.; the Bartlett's Ferry plant of the Columbus Electric & Power Company, developing 40,000 hp.; the Cherokee Bluffs project of the Alabama Power Company, which will cost $10,000,000 and develop 140,000 hp. when completed, and many local steam plants in Arkansas and Texas.

Total developments to date for plants in the superpower belt of the South are estimated by the G. L. Miller Company as shown in the accompanying table.

It is undoubtedly this development of Southern steam and hydro-electric power that is more responsible than anything else for the rapidly expanding industrial development of the South.

Southern Power Company to Add 60,000 Hp. on Catawba

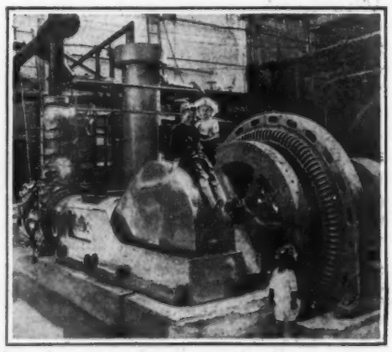
Announcement has just been made by officials of the Southern Power Company of the completion of plans for the construction in the near future of an additional hydro-electric power plant on the Catawba River. This plant will be built at Rocky Creek, Lancaster County, S. C., and will have a generating capacity of 60,000 hp. It will cost approximately $1,250,000, the low cost being explained by the fact that the existing Rocky Creek dam will be utilized also for the new plant, which will be on the other side of the river.

The new plant at Rocky Creek will be the twelfth hydro-electric plant in the Southern Power system, eleven of these being on the Catawba. It will increase the company's total hydro-electric generating capacity from 565,000 hp. to 625,000 hp. The five steam plants of the company, including the recently completed 40,000-hp. Tiger plant at Duncan, S. C., have a total generating capacity of 140,000 hp., making an aggregate in plants existing or under construction of 765,000 hp.

The new plant at Rocky Creek is being started just as the new Rhodhiss plant, 8 miles above Hickory, comes into commission. Work was also started several months ago on another Catawba plant which is being built on the site of the original hydro-electric plant of the Southern Power system 20 miles below Charlotte and near Rock Hill and Fort Mill. The new plant at this point, to which reference was made in the ELECTRICAL WORLD for July 12, 1924, page 81, will have a generating capacity of 80,000 hp. as compared with the 10,000-hp. rating of the original plant there.

Briefer News

New Ice Machine Does Work of Four in One-Eighth the Space.—The Carbondale Machine Company recently installed in the plant of the Los Angeles Ice & Cold Storage Company what is said to be the largest direct-connected, electrically driven, two-stage ice machine in the world. This 700-ton refrigerating machine is driven by an 800-hp., 2,200-volt, three-phase, 50-cycle General Electric synchronous motor. The compressor is a Carbondale-Worthington feather valve, two-stage type with a low-pressure cylinder 26 in. in diameter with a 30-in. stroke and a high-pressure cylinder 16½ in. in diameter with a 30-in. stroke. The machine operates at a speed of 150 r.p.m. and has a refrigerating duty equal to the melting of 700 tons of ice each twenty-four hours when operating at a pressure of 20 lb. suction and a condensing pressure of 170 lb. The complete unit occupies a floor space of but 400 sq.ft. It is now doing the work previously done by four low-speed compressors occuppying a total floor space of 3,200 sq. ft.



Coming Buffalo Electric Show.—Buffalo is planning to hold its third electric show on April 23 to May 2 in the Elmwood Music Hall, under the auspices of the Electrical League of the Niagara Frontier, and its promoters say that the two former shows will be surpassed, many special features supplementing the display of machinery and appliances.

Revised Wisconsin Code Available.—Copies of the second edition of the Wisconsin State Electrical Code, containing all revisions to date, are now ready for distribution. Public utilities, electrical contractors, electrical manufacturers and users of electrical apparatus subject to the requirements of this code may receive copies thereof by applying to the Industrial Commission of Wisconsin at Madison. A. J. Altmeyer is secretary.

Tenney Buys Newburyport Plant.—Charles H. Tenney & Company, Boston, have acquired a majority control of the Newburyport (Mass.) Gas & Electric Company, a central station and gas system serving the lower Merrimac River Valley and supplying energy to the town of Ipswich. The property is interconnected with the central station at Amesbury, Mass.

Electric Meter Section of Empire State Association Meets Next Week.—On Monday and Tuesday, April 6 and 7, the Electric Meter Section of the Empire State Gas and Electric Association will meet in the auditorium of the Utica Gas & Electric Company, Utica. Meter maintenance and records, installation practice, instrument transformers, induction-type relays and watt-hour meters will be among the topics discussed. Manufacturers of electrical measuring devices are planning an exhibit.

Massachusetts "Tech" to Hold "Open House."—The annual "open-house night" of the Massachusetts Institute of Technology will be held under the direction of the Combined Professional Societies on Thursday evening, April 16. In this event, started two or three years ago, students and faculty co-operate in entertaining visitors, and the laboratories are kept open and in operation. A 3,000-mile artificial cable and other electrical apparatus will be displayed.

No Settlement Yet of Northern Canada Power Litigation.—When the Nesbitt-Thompson interests formed the Canada Northern Power Company last December to take over the Northern Canada Power Company, it was taken for granted in Canadian utility circles that the long-standing litigation over

contracts with the Hollinger Mines would be automatically settled. A. J. Nesbitt, president of the Northern Canada Power, has now informed the shareholders that this is not the case and that the suit may be carried to the British Privy Council, the court of last resort. The Hollinger Mines are the main customer of the company and a prime factor in the adjustment of the power situation in the mining district of northern Ontario.

Wisconsin Companies Seek to Merge.—Upon approval of the Wisconsin Railroad Commission the properties of the Mattoon Public Service Company, the Leopolis Light & Power Company and the Wittenberg Light & Power Company will be consolidated with the Central Wisconsin Power Company with headquarters at Clintonville. The Central Wisconsin Power is an Oshkosh company which sells, for distribution in a number of towns and in intervening rural communities, energy from its hydro-electric plant on the Embarrass River.

Another State Ratifies Six-State Colorado Treaty.—The attempt to put the Colorado River treaty into force by means of a ratification by six states, leaving Arizona out, has received the adhesion of the New Mexico Legislature, which has lined up with the Legislatures of Wyoming and Utah in its support. In Colorado, where the plan originated, it appears that it has not yet received formal legislative approval, as was at first reported; but friends of the measure expect Colorado as well as California and Nevada to pass it before the legislative sessions end.

Niagara, Lockport & Ontario May Absorb Olean Company.—The Niagara, Lockport & Ontario Power Company has petitioned the New York Public Service Commission for consent to purchase all of the capital stock and bonds of the Olean Electric Light & Power Company and to merge that company. The securities of the Olean company, which has franchises in Olean, Allegany and other places and recently negotiated for the acquisition of the Cattaraugus (N.Y.) Electric Light & Power Company and the Cuba (N.Y.) Electric Company, are now held by the Bradford (Pa.) Electric Company.

Hydro-Electric Development in Scotland.—The second stage in the construction of the largest hydro-electric system yet undertaken in the United Kingdom is now being entered on with the letting of a contract for the driving of a 15-mile tunnel under Ben Nevis from Loch Treig to Fort William in connection with the Lochaber hydro-electric scheme in the Scottish Highlands. The power developed is to be used for large aluminum works at Fort William belonging to the British Aluminum Company, and the cost of the whole scheme is estimated at $23,800,000. The object of driving this tunnel, which is to be 16 ft. in diameter and lined with concrete throughout, is to collect all the watersheds round one side of Ben Nevis over an area of 300 square miles, utilize convenient lochs as reservoirs, and so build up an 800-ft. head of water for use at Fort William. Work on the tunnel, which is an essential connecting link, will be begun at twelve different places and from two to three thousand men will be engaged on the work for the greater part of three years. There will really be two tunnels, one from a dam at Loch Laggan to another dam on Loch Treig, and then the long tunnel under one side of Ben Nevis to Fort William. The long tunnel is, however, to be proceeded with first, and the erection of the dams and the other tunnel, 4 miles in length, will be a subsequent stage in a scheme which will produce 56,000 hp. and ultimately achieve a rating put as high as 100,000 hp.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, January 3, page 76.]

American Institute of Electrical Engineers—St. Louis, April 13-17; Swampscott, Mass. (regional), May 7-9; Saratoga, N. Y., June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

New Mexico Electrical Association—Albuquerque, April 20-22. B. L. Wiles, Albuquerque, N. M.

Southwestern Division, N. E. L. A.—Eastman Hotel, Hot Springs, Ark., April 21-24. S. J. Ballinger, San Antonio Public Service Co., San Antonio, Tex.

Arkansas Utilities Association—Hot Springs, Ark., April 21-24. R. I. Brown, Arkansas Central Power Co., Hot Springs, Ark.

American Welding Society—New York, April 21-26. Miss M. M. Kelly, 29 West 39th St., New York.

American Electrochemical Society—Niagara Falls, N. Y., April 23-25. C. G. Fink, Columbia University, New York.

Southwestern Public Service Association—Rice Hotel, Houston, Tex., May 5-8. E. N. Willis, 403 Slaughter Bldg., Dallas.

Missouri Association of Public Utilities—Joplin, Mo., May 7-9. F. D. Beardslee, 315 North 12th St., St. Louis.

American Society of Mechanical Engineers—Milwaukee, May 18-21. C. E. Davies, 29 West 39th St., New York.

Southeastern Water and Light Association—Hotel Patten, Chattanooga, Tenn., May 19-21. W. F. Steiglitz, Columbia, S. C.

Electrical Manufacturers' Club—Hot Springs, Va., May 19-22. S. B. Belden, Jeffrey Manufacturing Co., Columbus, Ohio.

Middle West Division, N. E. L. A.—Hotel Fontenelle, Omaha, Neb., May 20-22. (Conjointly with Nebraska Section.) H. M. Davis, Fraternity Building, Lincoln, Neb.

Georgia Electrical Association—Atlanta, May 21-22. W. W. Barr, Georgia Railway & Power Co., Atlanta.

Electric Power Club—Hot Springs, Va., May 25-28. S. N. Clarkson, B. F. Keith Bldg., Cleveland, Ohio.

Electrical Supply Jobbers' Association—Hot Springs, Va., June 2-5. Franklin Overbagh, 411 S. Clinton St., Chicago.

American Association of Engineers—Orlando, Fla., June 2-5. C. E. Drayer, 63 East Adams Street, Chicago.

Iowa Section, N. E. L. A.—Waterloo, Iowa, June 3-4. H. E. Weeks, 623 Union-Davenport Bldg., Davenport.

National Electrical Credit Association—Atlantic City, June 6-7; Philadelphia, June 8-9. F. P. Vose, Marquette Bldg., Chicago, Ill.

Associated Manufacturers of Electrical Supplies — The Homestead, Hot Springs, Va., June 8-12. F. Nicholas, 30 East 42d St., New York.

Northwest Electric Light and Power Association (Geographic Division N. E. L. A.)—Gasco Bldg., Portland, Ore., June 12. W. A. White, Puget Sound Power & Light Co., Portland.

Pacific Coast Electrical Association (Geographic Division N. E. L. A.)—San Francisco, June 15. S. H. Taylor, 529 Rialto Bldg., San Francisco.

National Electric Light Association—San Francisco, June 15-19. M. H. Aylesworth, 29 West 39th St., New York.

Society for the Promotion of Engineering Education — Union College, Schenectady, N. Y., June 17-20. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Electricity Increases Pumping Capacity of City Station 30 per Cent and Saves $1,000 Monthly.—Steam and gasoline as motive powers have been displaced by electricity in two of the pumping stations operated by the Water Department of Baltimore. In the pumping station at Curtis Bay, where steam formerly was used, the city will save about $1,000 a month as compared with the former cost of fuel and labor and the capacity of the station will be increased more than 30 per cent. The saving due to the electrification of the Towson pumping station, where a gasoline engine was replaced, was enough to pay for the cost of the electrical installation in a short time.

Cleveland Company Buys Railroad to Insure Coal Supply.—The Cleveland Electric Illuminating Company has purchased a traction line running from Avon to South Lorain, Ohio, from the Lake Shore Electric Company, in order to insure a supply of coal for its new plant to be built at Avon, about 20 miles from Cleveland. To make the purchase a subsidiary company has been incorporated as the Avon Railroad Company. Between fifty and sixty cars of coal a day will be moved over this road, which crosses the Nickel Plate, New York Central and Wheeling & Lake Erie at South Lorain, thus tapping abundant coal fields.

New Central-Station Company in Pacific Northwest.—The West Coast Power Company of Portland, Ore., a Delaware corporation, organized in December, 1924, and headed by A. Welch, well known among utility operators of the Northwest, has acquired the entire assets of the General Light & Power Company, serving Newport and Toledo, Ore., and nearby beach resorts, and also Shelton, Wash.; the Waldport Lighting Company, serving Waldport and Bayview, Ore.; the Florence Electric Company, serving Florence, Glenada, Cushman and Acme, Ore., and the Shorey Light & Power Company, serving Reedsport and Gardiner, Ore. Interconnections and extensions of these properties are planned.

Rice Lake, Wis., Gives Up Idea of Municipal Ownership.—After a long fight before the Wisconsin Railroad Commission and in the state courts with a view to acquiring the local generating and distributing properties of the Northern States Power Company, the City Council of Rice Lake, Wis., has voted to stop further proceedings. The question, however, can be reopened provided that a petition bearing a sufficient number of names is presented before April 11. Five years ago the city voted 230 to 76 in favor of purchasing the plants, but, faced with the problem of continued legal preceedings, the City Council has become convinced that this would not be in the public interest.

Men of the Industry

Sterns and Burt Become Vice-Presidents of New Iowa Utility

Within recent months a merger of the Citizens' Gas & Electric Company of Waterloo and the Northern Iowa Gas & Electric Company of Humboldt with other properties was consummated. The new company is known as the Central Iowa Power & Light Company with offices in Waterloo.

Don M. Sterns, Humboldt, Iowa, vice-president and general manager of the Northern Iowa Gas & Electric Company, has been named vice-president in charge of business and commercial

D. M. STERNS

matters in the newly formed merger company. Mr. Sterns has for many years been a resident of Humboldt, where he was owner with his father of a water-power electric plant on the Des Moines River. Expansion of this enterprise under the able direction of Mr. Sterns resulted in the formation of the Northern Iowa Gas & Electric Company, now merged with the Citizens' Gas & Electric Company of Waterloo in the new company. He is at present president of the Iowa Section of the National Electric Light Association.

Austin Burt, general manager of the Citizens' Gas & Electric Company at Waterloo for the past twenty-two years, has been named vice-president of the Central Iowa Power & Light Company in charge of engineering. Mr. Burt is a graduate of Cornell University and spent considerable time as a student in the Allis-Chalmers plant at Milwaukee. Following the completion of his studies he went to Cedar Falls, Iowa, being associated with the electric plant there until 1902, at which time he became general manager of the Waterloo company.

Ralph H. Garrison, formerly assistant manager of the Citizens' Gas & Electric Company of Waterloo, Iowa, has been named as general manager of the Waterloo division of the Central Iowa Power & Light Company, succeeding Austin Burt. Mr. Garrison went to Waterloo a year ago from the United Electric Light & Power Company of New York. His long connection with the management of gas and electric properties has proved of great value to the local company.

H. B. Maynard of Waterloo, Iowa, who for the past nineteen years has been secretary of the Citizens' Gas & Electric Company of that city, has been named secretary of the Central Iowa Power & Light Company. His duties will now embrace the entire territories covered by the newly merged properties.

Howard M. Smith, formerly superintendent of the gas plant at Waterloo, Iowa, and later manager of the combined properties at Kewanee, Ill., and following the closing of those properties transferred to the Charles City (Iowa) plant, has been named manager of the Charles City division of the Central Iowa Power & Light Company.

Richard J. Mullins, for a number of years general superintendent of the Northern Iowa Power & Light Company of Humboldt, Iowa, has been named manager of the Humboldt division of the Central Iowa Power & Light Company. Mr. Mullins was formerly of Webster City, Iowa, where he assisted in building up the electric company.

Guy Talbot Elected President of Northwestern Electric

Following the purchase of the Northwestern Electric Company, Portland, by the American Power & Light Company interests, as announced previously in the ELECTRICAL WORLD, the new board of trustees met and elected the following officers: Guy W. Talbot, president; John A. Laing, vice-president; L. T. Merwin, vice-president; George L. Myers, assistant to the president; C. W. Platt, secretary and treasurer, and A. N. Cudworth, assistant secretary and assistant treasurer. Messrs. Talbot, Laing, Myers and Platt hold the same positions in the Pacific Power & Light Company and the Portland Gas & Coke Company, other American Power & Light Company properties in the Northwest, while Messrs. Merwin and Sudworth retain the same positions that they both have long held with the Northwestern Electric Company.

Dr. Charles E. Lucke, professor of mechanical engineering and head of the department of mechanical engineering at Columbia University, has been retained by the Babcock & Wilcox Company, New York, as consultant.

Theodore K. Jackson, president of the Mobile (Ala.) Electric Company, has resigned to affiliate himself with other interests after a long and successful career as an operating executive in the Byllesby organization.

O. C. Wright, formerly manager of the Louisville office of the Utility Securities Company and of the Kentucky Utilities Company, has been placed in charge of the investment department of the Interstate Public Service Company, Indianapolis. Mr. Wright is succeeding W. Marshall Dale, recently promoted to the office of secretary and treasurer.

William McClellan Appointed to Muscle Shoals Commission

William McClellan, president of McClellan & Junkersfeld, engineers and constructors, New York, and a past-president of the American Institute of Electrical Engineers, has been appointed by President Coolidge a member of the commission appointed in accordance with the request of Congress to investigate the Muscle Shoals situation. During the early part of his career Mr. McClellan was intimately identified with the technical progress of the electrical art, pioneering in the electrification of railroads and public utility expansion. Following his graduation in 1900 from the University of Pennsylvania and five years spent there as instructor, he was engineer in charge of construction of the Phila-

WILLIAM MCCLELLAN

delphia Rapid Transit Company. After several years' association with Westinghouse, Church, Kerr & Company in 1907 he became a member of the firm of McClellan & Campion. In 1911 he was appointed electrical engineer and chief of the division of light, heat and power of the Public Service Commission of the Second District of New York State. For three years Dr. McClellan served as dean of the Wharton School of Finance and Commerce of the University of Pennsylvania, resigning, to resume his former relations in the firm of McClellan & Campion, with engineering offices in New York and Philadelphia. From 1919 to 1921 he was a vice-president of the Cleveland Electric Illuminating Company, relinquishing these duties to devote his time to his consulting practice. Early in 1922 he, together with Peter Junkersfeld and Horace T. Campion, organized McClellan & Junkersfeld, Inc., to engage in engineering and construction work.

Mr. McClellan has long been active in the affairs of the American Institute of Electrical Engineers. He has served as manager, vice-president and president, filling the office last named in 1921-1922. He is a member of the National Electric Light Association, the American Society of Mechanical Engineers and other technical societies.

H. A. Parsons, Jr., has been appointed executive manager of the Electric Club of Philadelphia by the board of governors of the club, to devote his

entire time and energy to such activities as will prove of benefit to the electrical industry and the members of the organization.

P. C. Dings, a director of the Illinois Power & Light Corporation, Chicago, has been elected treasurer of the company to succeed George M. Mattis.

Harold J. Riefler, formerly of Springfield, Ill., has been made publicity manager for the Public Service Company of Northern Illinois, Chicago.

M. E. Rhoads, formerly new-business manager of the Ohio Public Service Company at Mansfield, has been transferred to a similar position at Lorain.

Edward B. Craft, executive vice-president of the Bell Telephone Laboratories, Inc., has been elected a director of that corporation to fill the vacancy left by the resignation of Walter S. Gifford.

Fred W. Erickson has been appointed advertising manager of the Milwaukee Electric Railway & Light Company to take charge of the electric light, power, city, interurban and bus advertising activities of the company.

Z. R. Mahan, formerly manager of the Alabama Power Company at Prattville, is now connected with the Montgomery district in the distribution department.

W. B. Newell of the engineering department of the Savannah (Ga.) Electric & Power Company has been transferred to the engineering department of the Tampa (Fla.) Electric Company.

E. J. Niederkorn, district manager of the Northern States Power Company at Alma, has been placed in charge of the company's electric properties in the Wabasha district in Minnesota, which has been combined with the Alma district.

C. F. Steger, formerly assistant treasurer of the Nova Scotia Tramways & Power Company, Ltd., has been assigned to the assistant treasurership of the Edison Electric Illuminating Company of Brockton, Mass.

Joy Herbert, who has been special representative of the Ohio Public Service Company at Ashland, has been promoted to the position of new-business manager at Mansfield to succeed M. E. Rhoads, recently transferred to Lorain.

Arthur E. Allen, manager of the New York office of the Westinghouse Electric & Manufacturing Company, has resigned to affiliate himself with the Westinghouse Lamp Company. Mr. Allen has been associated with the Westinghouse Electric since 1902, entering its employ in the Newark works. Later being transferred to the New York office, he was appointed manager of the supply division. Upon his discharge from military service in 1919 Mr. Allen returned to the New York office as executive assistant to the manager and subsequently was promoted to the position of district manager.

H. E. Sandoval, manager of electric sales of the Pacific Gas & Electric Company, has resigned that position to become president and general manager of the Sandoval Sales Company, San Francisco. The new firm will act as manufacturer's agent and has already taken on the line of Wesix electric heating products. Mr. Sandoval joined the Pacific Gas & Electric Company in 1913, where he has been manager of electric sales for the past several years. He is well known in the light and power industry through his activity in the commercial sections of the Pacific Coast Electrical Association and the National Electric Light Association.

Pestell Made Vice-President Riley Stoker Corporation

William Pestell, since 1921 sales manager of the Riley Stoker Corporation, with headquarters at New York City and Worcester, Mass., has been appointed vice-president of the company and will continue in charge of sales. Mr. Pestell is widely known in the central-station field. For some time he

WILLIAM PESTELL

was active in the power plant side of electric railway work in Massachusetts and Rhode Island and later represented the Allis-Chalmers Company at Boston. For several years he was employed as a mechanical engineer by the J. G. White Engineering Corporation, New York.

Paul S. Bond has been transferred from the Claire office of the Consumers Power Company, where he had been doing construction work, to the local managership at Charlotte to succeed H. H. Stephens, who has assumed new duties in the company's general office at Jackson, Mich.

Ira E. Guthrie, secretary and treasurer of the Interstate Public Service Company, Indianapolis, has resigned after serving in this capacity for more than twelve years. Mr. Guthrie also resigned from membership on the company's board. His retirement was necessitated by illness in his family.

W. Nelson Smith, consulting electrical engineer of the Winnipeg Electric Company, has returned to Winnipeg after a leave of absence of about a year in Vancouver, B. C., where he assisted the Sydney E. Junkins Company, B. C. Ltd., in preparing a report on the electrification of the mountain district of the Canadian Pacific Railway. Mr. Smith's experience in steam-railway electrification reaches back more than twenty years. Mr. Smith is now engaged in a valuation of the extensive light and power distribution system of the Winnipeg Electric Company.

H. C. Riggs has been placed in charge of the electric truck bureau recently established by the Union Gas & Electric Company of Cincinnati to co-operate with business houses in solving their transportation problems. Mr. Riggs will handle the work in Cincinnati, Dayton and neighboring cities.

T. B. Wilson, vice-president and general manager of the Louisville (Ky.) Gas & Electric Company, and **C. M. Brewer,** vice-president and general manager of the Mountain States Power Company, Albany, Ore., have been elected members of the board of directors of the Standard Gas & Electric Company, which controls both these companies.

H. E. Huff has been appointed general manager of the Southern lamp division of the National Lamp Works of the General Electric Company, with headquarters in Atlanta, Ga. Mr. Huff has been with the National Lamp Works since 1909. For a year he was connected with the engineering department, going from there to the Buckeye electric division, with which he was associated at the time of his recent promotion. Since 1913 Mr. Huff has been in charge of the Cleveland district, a territory comprising Ohio and portions of Indiana, Michigan and New York.

Frank Hodson, founder and president of the Electric Furnace Construction Company, Philadelphia, and vice-president of its successor, the General Furnace Company, is severing all connections with that company to enter business for himself as a consulting engineer and metallurgist, specializing on designs, layout, construction and operation of metallurgical plants, investigations, reports and appraisals of plant. His early training, practical work in metallurgical plants, technical knowledge and broad experience should make his services of considerable value. Mr. Hobson is a member of the American Electrochemical Society, the Association of Iron and Steel Electrical Engineers, the Iron and Steel Institutes (American and British), and for many years past has contributed papers and articles to these societies and to the technical press.

Obituary

J. Epps Brown, chairman of the board of directors of the Southern Bell Telephone Company, died March 27 in his fifty-eighth year after an illness of several years' duration. Mr. Brown's association with the Southern Bell system covered a period of twenty-six years.

Earl B. Bilsland, superintendent of the Covington (Ind.) electric light and water plant, died March 18 at his home after a long illness. He was born on a farm north of Covington March 16, 1881, and had been associated with utility development many years.

William J. Marshall, an executive of the Conlon Corporation, Cicero, Ill., died Tuesday, March 17, at his home in Cleveland Heights, Ohio. Mr. Marshall was well known in Cleveland electrical circles through his former connection with the Ohio Public Service Company as commercial manager at Warren, Ohio.

Commission Rulings

Permission to Issue Preferred Stock Refused Where Company Did Not Earn Bond Interest.—Authority to issue cumulative preferred stock was denied by the California Railroad Commission to the San Gorgonio Power Company on the ground that the company was not earning its bond interest and that it was doubtful whether dividends could be paid for several years. "While it is true," the commission said, "that the dividends on the preferred stock are not a fixed charge, yet it is a fact that many purchasers of preferred stock believe or are led to believe that dividends on such stock are guaranteed and will be paid without fail."

Deposit Equivalent to Average Bill Reasonable.—"Since bills are rendered monthly," said the Arizona Corporation Commission in adjudicating a complaint docketed as Spear vs. Van Dyke, "and since a reasonable time is given for payment of accounts after notice, we think that a rule which will permit and authorize the company to demand a deposit equivalent to the average bill of a consumer for the class of service which he may seek over a period of forty days will be reasonable, and the same is hereby approved. In the event of weekly or other frequent readings of the meters, as for example in restaurants, the deposit demand should cover not to exceed ten days beyond the period of meter readings."

Items of Preliminary Legal and Engineering Expense Not Capitalized.—An item for legal, engineering and other expenditures was eliminated by the Missouri Public Service Commission from the basis of security issues of the Public Service Company of Missouri. The commission said that this expense was incurred by reason of appraisal, valuation and other miscellaneous costs incident to the purchase of the property; in other words, that it was made to advise the investors as to the values of the properties under consideration. Therefore the commission held that it added nothing to the value and should not be capitalized, but should be paid out of surplus.

Indirect Method of Measuring Energy Furnished Central Station by Mill Under Same Control Approved.—Complaint was made to the Wisconsin Railroad Commission that there was an unfair apportionment of costs between the Pardeeville Electric Light Company and the Fox River Milling & Power Company, two concerns under the same control which exchange electrical energy. It appeared that the former purchased all the surplus energy of the latter and also purchased at the same rates energy from a third company, the Wisconsin Power, Light & Heat Company. The total amount received from both companies was registered on a master meter, the amount received from the Wisconsin company was registered on a substation meter, and the amount consumed in the mills was registered on a meter there installed. The substation figures and the mill figures were added together and then subtracted from the figures on the master meter, the difference being held to be the amount purchased by the Pardeeville company from the Fox River company. The commission supported this method of computation, adopted to save the expense of another meter to register only energy supplied to the milling company, holding that if the mill demand was at all times below the maximum shown by the Wisconsin company's meter, it was immaterial whether it might draw some energy from the transmission line in addition to what it used from its own generating equipment.

Request for Revaluation Must Be Based on Substantial Grounds.—Refusing to make a revaluation of the property of the Virginia Railway & Power Company of Richmond merely because the Legislature had provided funds for the purpose and because of the allegation that the first valuation was based upon evidence produced by engineers employed by the utility company and that a valuation in another case was less than that found by the same experts, the Virginia State Corporation Commission said: "In order for the commission to be justified in making a revaluation, as distinguished from an original valuation, it would be necessary for the party asking for same to show at least *prima facie* a situation justifying the delay, expense and incident inconvenience, or the commission would have to be satisfied from some source that under all the circumstances a revaluation should be made in order to do justice to all parties concerned, and especially to the general public."

Recent Court Decisions

Carolina-Tennessee Power Company Allowed to Condemn Hiawassee River Power Company Holdings.—The United States Supreme Court has dismissed for want of jurisdiction, because no substantial federal question was involved, the appeal of the Hiawassee River Power Company from an adverse decision of the North Carolina Supreme Court in favor of the Carolina-Tennessee Power Company. Both companies are North Carolina corporations. The Carolina-Tennessee company was incorporated in 1909. In 1911 it surveyed and filed certain lands and water rights in Cherokee County along the Hiawassee River. About this time the company experienced temporary financial difficulties. The Hiawassee company was incorporated in 1914 and purchased certain lands and water rights. In 1922 the Carolina-Tennessee company sued to condemn, under the terms of its charter, water rights and lands of the Hiawassee company. The latter resisted, but verdict was given for the Carolina-Tennessee company and damages of $30,350 were fixed. This was upheld by the State Supreme Court. In its defense the Hiawassee company alleged that the charter of the Carolina-Tennessee company was invalid and that it did not intend to develop a power plant but desired the rights for speculative purposes. The Hiawassee company claimed that the value of its holdings was close to $200,000. The proposed dam on the Hiawassee River, over which the lawsuit came, contemplates a development of 3,000 hp.

Accident Liability of Electric Company Maintaining Wires Over Bridge.—The Court of Appeals of the State of Missouri has decided in the case of the St. Louis & St. Charles Bridge Company vs. Union Electric Light & Power Company that when a contract exists between a bridge company and an electric company maintaining electric wires over the bridge due notice must be given by the bridge company of any contemplated repairs. If such notice is not officially given to the electric company, the electric company cannot be held responsible for accidents arising from electricity in the wires. (268 S. W. 404.)*

Right-of-Way Can Be Condemned Only for Public Use in Entirety.—By a ruling of the Supreme Court of the State of Washington just handed down, the Puget Sound Power & Light Company is estopped from acquiring lands by condemnation proceedings for its transmission line from the Baker River project. The decision upheld the Superior Court of Snohomish County, which had denied the right-of-way sought on the ground that the electrical energy to be developed at the Baker River plant is not intended essentially for public use and, further, that the company now has a surplus of 23,000 hp. in operation and that a large part of the 18,000 hp. to be developed on Baker River would be diverted to uses other than public. The company took the case to the Supreme Court after condemnation proceedings had failed to secure easements over certain lands.

Powers of Public Service Commission to Be Liberally Construed.—The Supreme Court of Appeals of Virginia in reviewing decisions of the State Corporation Commission of Virginia affecting street-railway franchises (City of Portsmouth vs. Virginia Railway & Power Company) declared that the section of the constitution empowering the commission to supervise, regulate and control transportation and transmission companies in matters relating to the performance of their public duties will be liberally construed to grant the commission every power fairly implied from the language used or necessary to enable it to exercise powers expressly granted. (126 S. E. 362.) In City of Richmond vs. Virginia Railway & Power Company the court held that the commission, under the police power of the state, could regulate street-car rates during the term of the company's contract with the city, even if the city's charter gave it power to prescribe rates, since the right to prescribe would be in abeyance during life of contract. (126 S. E. 353.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Manufacturing and Markets

Business Activity Good

Survey by Industrial Conference Board Predicts Steady Demand for Rest of Year

CONTINUED improvement in industrial conditions, generally at a conservative pace, is indicated by the monthly report of the National Industrial Conference Board for January on wages, hours and employment, while a tendency toward increase in the purchasing value of the dollar is indicated by the board's report on the cost of living, showing a decrease of 1.1 per cent between January 15 and February 15. Factors making for improved industrial conditions in January were increased employment, increased working hours and an increase in the average weekly earnings of all workers.

A stable, sound and even flow of business activity for the remainder of the year is forecast in the opinions given by industrial leaders in a survey made by the board. Business during the rest of the year, it is shown, will probably be conducted under conditions of rising interest rates for loans, with a tendency toward lower prices in some industries and generally stationary wages. While there is no expectation of a boom, the board finds that this is considered an advantage rather than otherwise, a steadier movement of business being felt to be more conducive to sane and dependable conditions. In this connection four notable achievements during the past five years are emphasized as contributing to more steady and sound business conditions: first, more stable employment in relation to changes in production; second, greater conservatism in expanding production and trade in relation to price changes; third, a shortening of the line of distribution from manufacturer to consumer, and, fourth, greater dependability of transportation service.

INDUSTRY'S EFFICIENCY HIGHER

Greater elasticity of production in adjusting itself to price changes, it is believed, has been brought about by industry's demonstrated ability to increase greatly the volume of production with a relatively smaller expansion in employment. This, it is pointed out, tends to eliminate the hectic activity usually resulting from marked price fluctuations. The demonstrated capacity to produce more, though employment does not increase or may even fall off, is hailed as one of the most encouraging signs in recent industrial history, indicating more efficient management and greater efficiency of labor or mechanical application, or both.

The need of careful management is suggested partly by the financial situation and partly by wage conditions, both compelling industry to proceed on a comparatively narrow basis of profits. That the margin of the loan power of the banks has been affected by a series of foreign loans and extended speculation is the keynote of an analysis of the financial situation. This, it is anticipated, will in the next few weeks result in a reduction of speculative commitments in the security markets and withdrawal of loans in that field, with continued backward movement of prices, and also in an upward movement of interest rates. Banks now are reported as already unloading bonds to meet demands for commercial loans. On the other hand, wages, which on the upgrade had risen more than in proportion to the increase in employment, have not decreased in proportion to decrease in employment, and hardly any decrease in wages took place during the employment slump in 1924.

Large User's Discount a Problem

Difficulty of Equitable Application—Failure to Stimulate Trade or Encourage New Development Is Charged Against Practice

BY A MANUFACTURER

THE so-called large user's discount, prevalent in the electric motor industry, is becoming a problem in the electric controller industry. Certain manufacturers in the controller field are convinced that the general adoption of the large user's discount would be detrimental to the growth and development of this industry. Some others are of the opinion that competition demands such a means of price shifting. Other manufacturers, while believing this special discount to be detrimental to the industry, consider its coming to be inevitable because of existing conditions of competition. Apparently, the problem of the large user's discount is one of equity versus expediency. Before adopting this practice a manufacturer may well consider three things —first, the effect on trade activity; second, the effect on new development, and third, the problem of the application of the discount.

Discounts from the user's price are generally designed to pay for services rendered by the jobber, dealer or other agent of the manufacturer, or to encourage larger purchases on the part of the user. Stimulation of trade is the object sought by the manufacturer in offering discounts. It is difficult to see where discounts to users of control apparatus for their own factory equipment will result in greater volume of trade. The majority of control apparatus is used for special applications of special or standard equipment.

FAILS TO STIMULATE TRADE

The greatest stimulation of most controller sales comes from the active study of possible applications and sales efforts directed toward convincing the prospective customer of the desirable results to be expected from a given application. Under this method of business development the customer has generally been convinced and his decision to purchase made before the question of a discount arises. The special discount has contributed nothing to the development of potential business, but because of its loose application it only serves to deflect the business to the manufacturer who offers it.

If all manufacturers offer the special discount, the effect is little different from a general reduction in price. At the time the business is placed the manufacturer who thinks that he needs the order to keep his factory running or who wishes to obtain the account of this particular customer will usually be able to obtain it by offering this special discount. Under such conditions the next order from this purchaser may very likely go to some other manufacturer who at that time feels the greatest need for the business and who is willing to offer the special discount to secure the order. Whatever the reason for the large user's discount, it has failed to make two orders grow where one grew before. The first charge against this special discount is that it fails to stimulate business and only deflects business to a given manufacturer at a given time.

DISCOURAGES DEVELOPMENT

The uncertainty of where the large user's discount will be applied discourages minor developments by the manufacturer. Take the case of a controller on which a manufacturer wishes to make a small improvement, adding perhaps 5 per cent to the price of the article. The manufacturer is able to demonstrate the increased merit of his article and quotes the slightly increased price. Suppose now that one manufacturer's representative decides that for the purpose of this order the purchaser is a "large user." This salesman accordingly offers a large user's discount of 10 per cent. If the various bids were about on a par before the one article was slightly improved and before the special discount was applied to the other, there now exists a difference of 15 per cent between the improved article and the regular equipment carrying the special discount. The manufacturer of the improved article will thus have difficulty in overcoming the price difference of 15 per cent and will probably lose the order. Needless

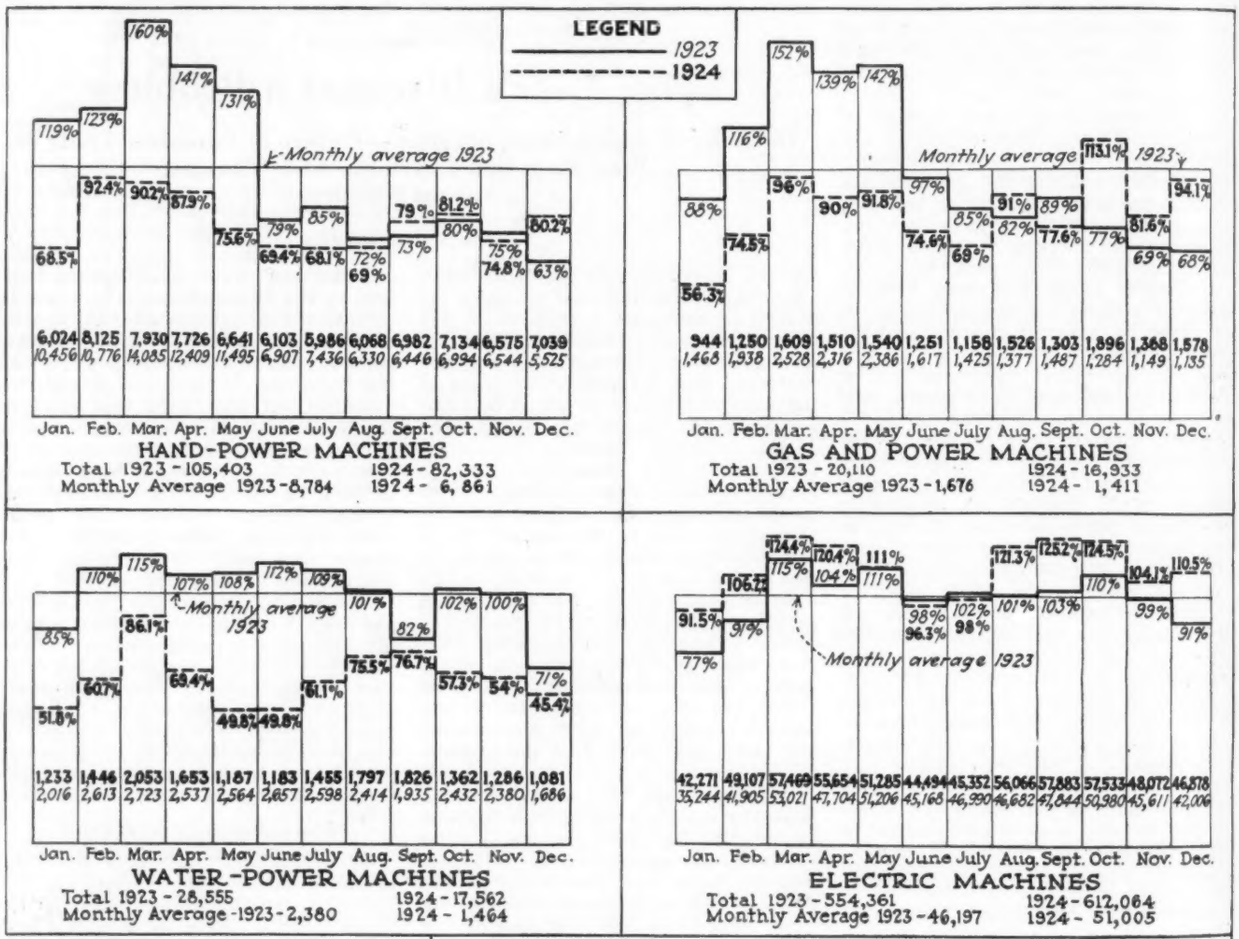
to say, this manufacturer will be discouraged from making small improvements to standard apparatus as he will not take the risk of being unable to meet the possible application of the large user's discount.

The feature of the large user's discount that makes it most harmful is its loose application. If this discount were always based on the size of the individual order or on the annual volume of business from a given customer, the problem would be comparatively simple. Or if this discount were based on the national distribution of the product of the business carried on by the purchaser, the problem would be less difficult. In actual practice, however, it is found that for a given order the application of the large user's discount may be based on one or both of the above artificial conditions.

The impression made on the prospective purchaser by the improper application of this discount is generally one not beneficial to the trade. Suppose one salesman decides that a firm is not entitled to the large user's discount and quotes the regular price. A competitor decides that the large user's discount is justified and on the same piece of apparatus quotes a price 10 or 15 per cent lower. The first salesman, knowing his company will consider the large user's discount and realizing that the order is slipping away because of the competitor's lower price, falls in line and revises his quotation. The prospective customer discovers that bartering is possible, and not only is he liable to call in additional competitors to see what prices they may quote, but the chances are that placing of the business is delayed, while the purchaser's confidence is shaken in the apparatus which he buys. This certainly constitutes an undesirable situation.

EQUITABLE APPLICATION DIFFICULT

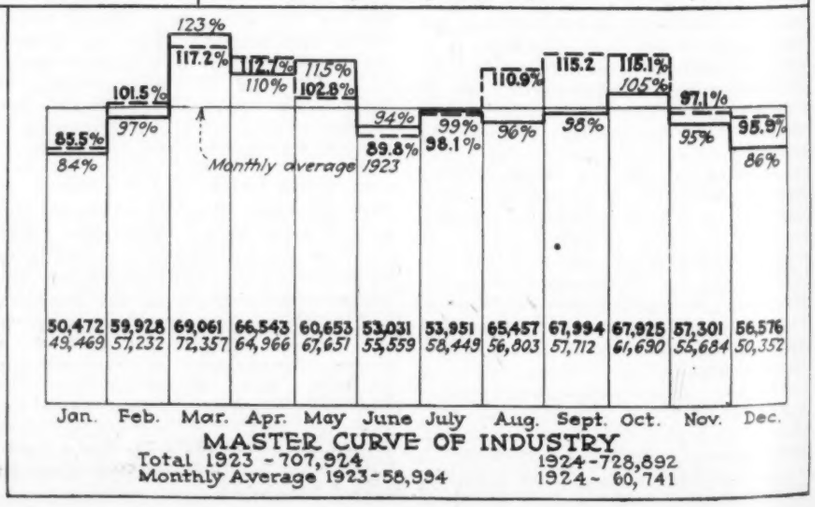
The difficulty of an equitable application of the large user's discount is thus


LEGEND
1923
1924
Monthly average 1923
HAND-POWER MACHINES
Total 1923 - 105,403 1924 - 82,333
Monthly Average 1923 - 8,784 1924 - 6,861
GAS AND POWER MACHINES
Total 1923 - 20,110 1924 - 16,933
Monthly Average 1923 - 1,676 1924 - 1,411
WATER-POWER MACHINES
Total 1923 - 28,555 1924 - 17,562
Monthly Average - 1923 - 2,380 1924 - 1,464
ELECTRIC MACHINES
Total 1923 - 554,361 1924 - 612,064
Monthly Average 1923 - 46,197 1924 - 51,005
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

Sales of Washing Machines

Month by Month Record for the Years 1923-1924

The percentage figures given for each month are based on the monthly average for 1923. These data were furnished by the American Washing Machine Manufacturers' Association.


Monthly average 1923
MASTER CURVE OF INDUSTRY
Total 1923 - 707,924 1924 - 728,892
Monthly Average 1923 - 58,994 1924 - 60,741
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec.

apparent. The situation is not unlike that reported by a world traveler who observed that the greatest danger from bandits was to be experienced in the large American cities. Throughout the Orient, the traveler remarked, the areas infested with bandits were generally well known and could be more easily avoided, while in the great American cities one never knew where a bandit might appear. The uncertainty of where the large user's discount may have to be met constitutes its greatest menace to the steady, normal and satisfactory development of the electric controller industry. Until it can be demonstrated that the large user's discount stimulates business, encourages new development and is susceptible to fair and equitable application manufacturers of control apparatus may well refuse to sanction this practice.

Trade Commission Rules

Unfair Practices Are Not to Be Entertained Unless Affecting Public—Hearing Before Complaint

THE Federal Trade Commission has announced changes in its rules of procedure and policies which are of a far-reaching character. Proceedings in cases of alleged unfair practices will not be entertained where these practices do not tend to suppress competition as it affects the public but constitute purely a private controversy redressable in the courts. The commission also has adopted a rule providing for hearings by proposed respondents before a complaint is issued. The following statement was issued by the commission for the guidance of its force:

"Hereafter it shall be the policy of the commission not to entertain proceedings of alleged unfair practices where the alleged violation of law is a purely private controversy redressable in the courts, except where said practices substantially tend to suppress competition as affecting the public. In all such cases there must be three parties involved, the respondent, the competitor injured and the public. In cases where the alleged injury is one to a competitor only and is redressable in the courts by an action by the aggrieved competitor and the interest of the public is not substantially involved, the proceeding will not be entertained. The chief counsel is hereby directed to report to the commission with a memorandum stating his reasons and views on all such cases now pending for the disposition of the commission, and the chief examiner shall also report to the commission all pending applications for a complaint where the examination in his opinion shows that said application comes within this rule."

The rule calling for hearings by proposed respondents before a complaint is issued is as follows:

"In all cases before the board of review, before it shall recommend to the commission that a complaint issue, it shall give to the proposed respondent a hearing before said board to show cause why a complaint should not issue. Said hearing shall be informal in its nature and not involve the taking of testimony. The proposed respondent shall be allowed to make or submit such statement of facts or law as it desires. The extent and control of such hearing shall rest with a majority of said board. Three weeks' notice of the time and place of such hearing shall be served on the respondent by the secretary of the commission."

While under the old rule a notice and hearing is given after complaint is issued, a majority of the commission is of the opinion that the mere issuance of a complaint often is of damage to a respondent if it shall be found that the respondent is not guilty of the practices charged. It is impossible to obviate this in all cases, but the majority feels that great care should be exercised to avoid such effects. Therefore the majority believes it is in the interest of justice that before a complaint is issued against a party an opportunity should be afforded him to show any reason he may have either in fact or in law why a complaint should not be issued. The majority also believes that such hearings will be to the advantage of the commission by developing facts for its information from which it may be better able to determine if cause exists for the issuance of a complaint.

Business Conditions

BUSINESS is continuing on a good level, say electrical men, with some quietness evident during the past two weeks. General conditions are favorable, and much business is in sight, but buyers are maintaining a very conservative attitude. Some good orders have been reported as closed during the last week. Among these is one involving $500,000 placed by the Edison Electric Illuminating Company of Boston with the Westinghouse Electric & Manufacturing Company for transformers and equipment. The Westinghouse company has received an order for $200,000 for substation equipment from the United Electric Light Company, Springfield, Mass., and the General Electric Company announced the receipt of an order for approximately $500,000 worth of ornamental "Novalux" street-lighting units from the city of Chicago.

Certain specialties, such as electric ranges, water heaters and industrial electric furnaces, are enjoying very good sales and manufacturers report much better business than last year, with the result that they are falling behind in deliveries. Further weakening of the copper market caused a decrease of the published base copper price, and last week the American Brass Company announced further reductions on copper products.

In New England two large orders totaling $700,000 were placed by two central-station companies, and there is a growing activity throughout the district in industrial heating furnaces. Supply sales in that district were dull, but a large number of negotiations are pending. Sales are quiet but in fair volume in the New York district. Some good sales are reported by wire manufacturers in that territory, but buyers are maintaining a very conservative attitude. In the Southeast central-station orders were good, especially for power and distribution transformers, line materials and watt-hour meters. Orders from industrials in that section are normal, with a large increase anticipated. Construction and maintenance purchases have increased in the Middle West and the volume of sales is good. On the Pacific Coast business has been slow, prices have been less steady than previously, and orders have been cautious, being placed only for the smallest lots commensurate with a fair price.

Delinquent Electrical Accounts Again Higher in February

AN INCREASE in the number of delinquent electrical accounts for February, 1925, over January, 1925, has been reported by the National Electrical Credit Association, as shown in the accompanying table. In the Central division the number of accounts increased about 5 per cent, yet the total amount and the average amount decreased slightly. In the New York division there was a slight increase in number, but the total amount and average amount increased considerably, while in the Philadelphia division the number of accounts increased over 35 per cent, but the total amount was 30 per cent less and the average amount less than half. The New England and Pacific Coast sections showed a decrease in the number of accounts, but the total amounts and average amounts were much higher than in January.

DELINQUENT ACCOUNTS IN FEBRUARY

Branch and Month		Number of Accounts Reported	Total Amounts	Average Amount
Central Division:				
January,	1924	643	$104,657.18	$162.76
January,	1925	764	102,989.98	134.80
February,	1924	821	89,621.45	109.16
February,	1925	802	102,162.48	127.38
New York:				
January,	1924	248	40,799.00	164.00
January,	1925	308	42,186.00	137.00
February,	1924	365	54,688.00	150.00
February,	1925	334	79,033.00	237.00
Philadelphia:				
January,	1924	197	22,760.53	115.54
January,	1925	177	43,696.43	246.87
February,	1924	258	31,823.03	123.35
February,	1925	242	28,614.50	118.24
New England:				
January,	1924	28	3,948.95	141.03
January,	1925	65	6,577.12	101.18
February,	1924	33	4,789.14	145.12
February,	1925	60	7,601.01	126.68
Pacific Coast:				
January,	1924	19	1,896.43	99.81
January,	1925	22	2,775.57	126.16
February,	1924	9	1,072.04	119.11
February,	1925	18	6,239.15	346.62

Few Sales on Non-Ferrous Metal Market—Week Poor

THE principal non-ferrous metals received violent setbacks during the past week, carrying them to new low levels for the year. The demoralized condition prevailing earlier in the week has now disappeared, and on Wednesday some of the ground lost was recovered. Copper is now back to

NEW YORK METAL MARKET PRICES

	Mar. 25, 1925 Cents per Pound	April 1, 1925 Cents per Pound
Copper, electrolytic	14⅛	14⅛
Lead, Am. S. & R. price	9	8¾
Antimony	14½	14½
Nickel, ingot	31	31
Zinc, spot	7.70	7.40–7.475
Tin, Straits	53¾	52¾
Aluminum, 98 to 99 per cent	28	28

Base copper price April 1, 1925, 16 cents.

where it was last October. During the last few days the price of the metal dropped a full half cent per pound—a sharp decline, but not unusual for copper. Except for some good business last week Thursday and Friday, sales were light on the decline. A few producers did not sell a pound of copper in the domestic market.

The American Smelting & Refining Company reduced its contract price for New York lead from 9 cents to 8¾ cents on Thursday, March 26, and to 8½ cents on Monday, March 30. The declines in lead prices here have been brought about chiefly by the weakness in London, which would have resulted in the free entry of ore lead from Mexico had not prices here been reduced. Consumers, of course, have not been inclined to buy heavily, preferring to wait until the decline has run its course, unless absolutely bare of stocks.

Prime Western zinc was bought in large tonnages by galvanizers during the week. Sales reported totaled about 4,000 tons. The acute fall in price of the metal in London made it necessary to give substantial concessions to consumers, so that the price of Prime Western gradually dropped. Tin prices have shared in the general decline without attracting much buying on the part of consumers. One of the leading interests here has been decidedly bearish and prices have often been below London parity.

Sales Quiet but in Fair Volume in the New York District

BUSINESS in the New York district has tapered off somewhat. The last week has been generally reported as quiet. Wire manufacturers report a falling off of the market, but are receiving some good orders and inquiries from central-station companies. Much of this class of business is in sight, especially from one utility company in this district which has set up an ambitious distribution and general construction program. One wire company states that although there was a falling off of his sales in February, business transacted in the month of March has been much better. Some of the present hesitation in placing orders for cable is believed to be owing to the position of the lead market.

Indicative of the buyers' conservative attitude is a case where a central-station company ordered several carloads of insulators for delivery April 15. The manufacturer having the material available tried to ship two carloads on March 15, but the customer would not take them. In the meantime this shipment went elsewhere. On April 1 the customer desired immediate delivery, which cannot now be effected. A manufacturer of pole-line hardware reports that his sales are now quiet, but this condition was preceded during the last three months by many orders placed with the intention of taking advantage of low steel prices.

Certain specialties, such as electric ranges and water heaters, are enjoying very good sales. One company that sells apparatus to range manufacturers reports much better business than last year, and owing to this he is now behind in deliveries. A manufacturer of wiring devices says sales are a little off, but he is expecting a good increase and a steady business for the rest of the year. Jobbers' business has also fallen off. Sales of appliances are fairly good, but jobbers say that these are confined almost entirely to the product of companies which are carrying on an intensive advertising campaign.

Central-Station Companies Buying Actively in Southeast

CENTRAL-STATION orders for both high-tension and distribution transformers are being received in good volume in the Southeast. The demand for commercial and residential type watt-hour meters, principally the 5-amp. and 10-amp. sizes, is very satisfactory. Some orders for high-tension meters are also reported. Line materials are active, and street and highway lighting equipment is selling well, particularly in Florida, where numerous residential subdivisions have been and are being developed. Incandescent-lamp sales are very satisfactory, the volume being from 10 per cent to 15 per cent ahead of the same period last year.

Orders from industrials are about normal, but a large improvement in the textile field is anticipated. Washing-machine sales in this territory are increasing owing to intensive sales efforts on the part of manufacturers in competing with the readily available cheap colored domestic labor. One manufacturer states that his sales for the first quarter of 1925 exceeded those of any two years past. Good orders for industrial safety switches are coming from the Birmingham district. A safety-switch manufacturer reports that business for the first quarter of this year is double that for the same period of 1924. He announces the receipt of one order recently for $1,400 worth of switches for an industrial installation at Clinton, S. C.

Two more of the larger Southeastern power companies have entered the merchandising field, and their orders for stocks have considerably swelled the volume of jobbers' appliance sales in the past week or so. Jobbers report some improvement in general business conditions. Retail electrical business in Atlanta continues slow, though a slight improvement in the sale of lighting fixtures is to be noted.

Construction and Maintenance Buying Heavy in Middle West

THE volume of business in the Middle Western territory has increased considerably and the demand for most commodities has been quite satisfactory. Construction work is being carried on to a greater extent, and maintenance purchases by various utility companies have been particularly heavy. Among the interesting orders received was one for 775 distribution transformers, one for $300,000 worth of "Mazda" lamps, and one for $40,000 worth of circuit breakers. The demand for pole-line hardware has been active, and high-tension equipment sales were good. One central-station company purchased several large electric trucks recently.

Jobbers report that the volume of business is good and is well diversified. Renewed or contemplated building activity has resulted in large sales of wiring devices, conduit and wire. Appliance sales are normal, with radio sales a trifle slow. Prices remain generally firm, except for a ⅛ cent per pound reduction in the base price of copper products, a reduction of approximately 3 per cent to 5 per cent in the prices of code wire, while the Conduit Manufacturers' Association announced a reduction of approximately 15 per cent in the prices of conduit elbows and couplings. This last item is of considerable importance to the jobber, as it enables him to purchase his requirements of elbows and couplings direct from the conduit manufacturer at a price comparable with previous competition prices that had been in vogue by companies which manufactured these products alone, and to have them shipped together with his requirements of conduit, thus remedying a long-felt trouble.

Business Slow on Pacific Coast—Buyers Conservative

THE past two weeks have been the slowest of the year for both jobbers and dealers on the Pacific Coast. Prices are more unsteady than previously this year, with a downward tendency. Orders and inquiries have been cautious and in the smallest lots commensurate with a fair price. Railroad business stands out by contrast. One railroad order now pending covers 470 miles of No. 6 and No. 9 "BB" galvanized-iron telegraph wire, totaling a quarter of a million pounds. Floodlighting sales have been exceptionally heavy. The radiator manufacturers, having completed a good year, are preparing for an early solicitation of fall business, fortified by abundant co-operation from power companies. Lamp sales are tapering off, but summer sales are expected to be high. Appliance orders have slightly increased owing to intensive selling. Some vigorous advertising campaigns are being planned for table appliances.

Conduit business has run about 20 per cent over last year. Prices on externally operated knife switches have been reduced about 10 per cent and the new list value assortments exhibit the present tendency to emphasize the total value of an order rather than the individual quantities. Credit conditions are very good and considerably better than last year, despite poorer business from dealers. Stricter collections have set a policy which has helped the dealers financially through their exerting more pressure upon their own slow customers. The use of electricity for cooking purposes is growing rapidly, and in some sections it is hard to keep up with the demand. The month of March was the best in the building history of the city of Seattle. Permits

totaled approximately $3,000,000, the bulk being for homes, commercial buildings and apartments.

Central Stations Purchase Equipment in New England

TWO large equipment orders were features of electrical sales in New England during the past week. Both orders were obtained by the Westinghouse Electric & Manufacturing Company. One of them calls for the delivery of new substation equipment, including six 3,000-kva. transformers, feeder regulators and thirty-one truck-type switches, for the United Electric Light Company, Springfield, Mass., amounting to about $200,000. The other was awarded by Stone & Webster, Inc., and covers equipment and transformers for the Edison Electric Illuminating Company of Boston, amounting to about $500,000. A prominent manufacturer announces the sale of thirty electric glue pots, and several other manufacturers report growing activity throughout this district in industrial heating furnaces.

The jobbing and supply business in general is dull, though an encouraging tone is given by the heavy volume of inquiries and negotiations which is pending. Appliance sales are reported to have fallen off in some instances, but on the other hand, one group of central-station companies shows a good volume of sales in washers, cleaners, portable lamps, kitchen units and flatirons. In Fitchburg, Mass, sales of electric refrigerating equipment for soda-fountain use has been active. House-wiring materials are in good demand in many of the smaller cities and towns outside Boston. Much of the slackening in sales in this territory is undoubtedly due to the uncertainties of the wage issue in the building trades.

Activities of the Trade

General Electric Receives Large Lighting Equipment Order

The city of Chicago has placed an order with the General Electric Company for 6,500 more ornamental "Novalux" street-lighting units, which are sufficient to illuminate 125 miles more of streets under the plan proposed for relighting the entire city. The initial order for 6,500 units was received last October and reported in the November 1 issue of the ELECTRICAL WORLD. The two orders involve more than $1,000,000.

Westinghouse Acquires Patent Rights of Spencer Thermostat

The Westinghouse Electric & Manufacturing Company has announced the acquisition of the United States rights to a new type of heat-control device invented by John A. Spencer of Revere, Mass., for more than $1,000,000. The device, known as the Spencer thermostat, will be used to regulate automatically the temperature of electrical apparatus, and its first application has been in a new automatic flatiron.

The principle on which the Spencer thermostat acts is said to be so novel that it has received the first basic patent on quick-acting thermostatic bimetal devices that has ever been issued by the United States Patent Office.

Agreements Made Covering Use of Basic Radio Inventions

The American Telephone & Telegraph Company, the Postal Telegraph Company, the Radio Corporation of America and the Freed-Eisemann Radio Corporation have all made agreements with Dr. Marius A. Latour of Paris giving them the legal right to the use of basic radio inventions. Dr. Latour has waived claims for infringement. His inventions date back many years and cover the radio art so well that it is virtually impossible to build a receiving set today without infringing one or more of his patents. Dr. Latour was employed as an engineer by the General Electric Company at Schenectady from 1904 to 1911 and is said to be now receiving royalties from various other patents.

The Hazeltine Corporation, which was beaten in a lawsuit brought by Dr. Latour for infringement of his patents, has obtained control of the Latour Corporation, recently organized in Delaware to exploit the inventions of Dr. Latour. The patents are controlled by the Hazeltine Corporation, subject to the licenses which have been previously acquired by the above mentioned companies. In addition the corporation has purchased all radio inventions which Dr. Latour may make in the next five years.

Allis-Chalmers Receives Order for Hydraulic Turbines

The Allis-Chalmers Manufacturing Company, Milwaukee, has closed a contract with the Southern Power Company, Charlotte, N. C., for three hydraulic turbines of 21,000 hp. to operate under an effective head of 65 ft. at 100 r.p.m. The order also includes three hydraulic turbine governors of the actuator type with flyballs mounted on the turbine shafts. These turbines will be used at the Rocky Creek (S. C.) development reported in "News of the Industry" this week.

Electric Storage Battery to Erect Factory Branch at Boston

As part of the extension of its distribution system, the Electric Storage Battery Company, Philadelphia, manufacturer of "Exide" batteries, announces that a factory branch will be erected in Boston on Ashford Street, near Babcock. The new structure, which will cover approximately 35,000 sq.ft., will consist of a two-story office with a one-story manufacturing establishment in the rear. The new building will be laid out along the lines of the latest developments in the main factory at Philadelphia. This will be the fifth new factory branch building erected by the company within the past two years.

Pettingell-Andrews to Have New Business Home

Construction is proceeding rapidly on a new building to be occupied by the Pettingell-Andrews Company, Boston, electrical supply jobbers. The structure is on Stuart Street, between Berkeley and Clarendon Streets, in the Back Bay district. The company expects to move from its present quarters at Atlantic Avenue and Pearl Street about September 1.

The new building represents a total investment of approximately a million dollars and will be nine stories high, with basement 150 ft. x 100 ft. In addition to extensive warehousing facilities, the building will contain finely appointed exhibition rooms and a fixture studio for the use of customers selling at retail. The business will continue to be wholesale only.

Westinghouse Gets Orders for Station Equipment and Generators

An order for new substation equipment amounting to approximately $200,000 has been awarded the Westinghouse Electric & Manufacturing Company by the United Electric Light Company of Springfield, Mass. The equipment consists of six 3,000-kva. transformers, four feeder regulators and truck-type switching equipment consisting of thirty-one trucks. This station will be operated from the main generating station by supervisory control.

The company has also received an order for two vertical waterwheel generators, 15,625 kva., three-phase, 60-cycle, 11,450-volt, 257-r.p.m., complete with direct-connected exciters, for the Merced Irrigation District in central California.

The power obtained from this plant, which is in the nature of a byproduct, as the waters run through the waterwheels as fast as it is needed for irrigation purposes, will be sold wholesale to one of the large central-station companies on the Pacific Coast.

General Electric Employees Receive Awards

Forty-three General Electric employees have received Charles A. Coffin Foundation awards for signal contributions toward the increase of the company's efficiency or progress in the electrical art during 1924. Twelve of the prizes were won by shopmen, five by foremen, fifteen by engineers and seven by commercial men. Four special awards were made for the presentation of papers at company meetings. With each certificate of award there is a prize of $250.

The purpose of the employees' awards is recognition for unusual service rendered. It was established by the board of directors of the company in 1922 as an expression of the appreciation for the work in the electrical industry of

its founder, Charles A. Coffin. All employees have equal chances—the work of the shopman is not compared with that of the engineer but with that of other shopmen. One class does not have preference over another.

Awards totaling $39,531 were also paid to 3,244 employees of the company during 1924 for suggestions which increased the efficiency of the plant's operations. The suggestions ranged from those covering safety devices for the protection of workers to ideas on improved methods of manufacturing electrical apparatus, and the awards ranged from $1 to $1,000.

Master Electric Company Purchases New Factory

The Master Electric Company, Dayton, Ohio, motor manufacturer, has purchased property on Linden Avenue formerly owned by the Davis Sewing Machine Company. The property includes a three-story modern concrete factory building with more than 60,000 sq.ft. of floor space, four smaller auxiliary factory buildings and a strip of land adjoining the Pennsylvania Railroad track which will allow for future expansion. At the present time the company has approximately 250 employees, and it is expected this will be increased to 500 under expansion plans for the new building.

The Westinghouse Electric & Manufacturing Company has recently opened a branch sales office in Davenport, Iowa, with temporary quarters in the Central Office Building. The new office, in charge of R. L. Irwin, will serve territory on both sides of the Mississippi River from Dubuque, Iowa, and the northern line of Illinois to Quincy, Ill., and Hannibal, Mo. Associated with Mr. Irwin will be D. R. Martin, industrial salesman; W. J. Westphalen, central-station salesman; A. K. Swindell, lamp salesman, and H. J. Campbell, on equipment.

Edward T. Moore, manufacturer of the Moore electric power regulator ("PK" load reducer), announces the receipt of recent orders for power regulators from the following companies: Crucible Steel Casting Company, Lansdowne, Pa.; Jessop Steel Company, Washington, Pa.; Kelly & Jones Company, Greensburg, Pa.; McConway & Torley Company, Pittsburgh; American Manganese Steel Company, Chicago Heights, Ill.; Burnside Steel Company, Chicago; Simonds Saw & Steel Company, Lockport, N. Y.; National Paper Products Company, Carthage, N. Y.; Cayuga Rock Salt Company, Inc., Myers, N. Y.; General Motors Corporation (Brown-Lipe-Chapin Division), Syracuse, N. Y.

Hobart Brothers Company, Troy, Ohio, manufacturer of battery-charging equipment, etc., has awarded a contract for the erection of a three-story factory and office building, to cost about $50,000, with machinery and equipment.

The Automatic Electric Heater Company, Warren, Pa., has recently placed on the market an electric temperature regulator and a pressure regulator which have been designed particularly for use with domestic coal or oil burning furnaces. These regulators are for installation directly in the boiler and without the use of a relay will control motors or blowers up to and including ½ hp., 110 volts or 220 volts. They can be furnished for alternating or direct current.

The Galvin Electric Manufacturing Company, 3314 South Broadway, St. Louis, manufacturer of electric motors and apparatus, which recently had its plant damaged by fire, states that the loss was negligible, was confined to a very small portion of the plant and will not interfere with any production plans.

The Conlon Corporation, Chicago, manufacturer of Conlon electric clothes washers, announces that E. C. Connolly has been appointed district manager for the State of Ohio, with headquarters at Cleveland, to succeed W. J. Marshall, deceased. Mr. Connolly has been with the organization for more than six years.

The Wagner Electric Corporation, St. Louis, announces the removal of its Atlanta office and service station to 145 West Peachtree Street; also the removal of its Cleveland office to 1412 East Twenty-fifth Street.

Harold E. Trent, Philadelphia, manufacturer of electrical heating and temperature controls and district representative for Edwin L. Wiegand Company, Pittsburgh, announces his removal to 259 North Lawrence Street.

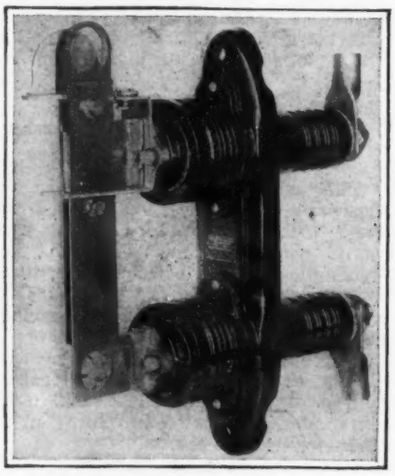
The Standard Turbine Corporation, Scio, N. Y., announces the appointment of the Hale-Stephan Company, 7016 Euclid Avenue, Cleveland, as its district representative.

Schweitzer & Conrad, Inc., 4421 Ravenswood Avenue, Chicago, manufacturers of high-voltage protective and switching equipment, are now making an addition to their factory which will provide more office and engineering department facilities to care for growing business.

New Equipment Available

Disconnecting Switches

A new line of disconnecting switches in which the cantilever strength of the insulator unit has been greatly increased is now being marketed by the General Electric Company. It is known as the type IG-17. The increase in strength has been obtained by the use of a double crimped cap and the addition of a pin cast integral with the lower fitting. Both hinge and contact clips are cast integral with their blocks,



DISCONNECTING SWITCH, SHOWING SAFETY CATCH

and the blade of the switch, being in two sections, possesses a high lateral rigidity. The use of bolts through the two sections of the blade, above and below the clip, provides a convenient means of contact pressure. A new type of latch or safety catch is furnished with this new line of disconnecting switches, and on double-throw switches there is a latch at each end. A new switch hook is also included in the development of this line, incorporating both a special "V" hook for this line of switches and a standard hook for operating other forms of disconnecting switches and latches.

Tempering Heater.—A new circulating-type electric oil heater for tempering metal, which is provided with automatic control, has been placed on the market by the American Metallurgical Corporation, 168 Dartmouth Street, Boston. This new furnace has a tempering capacity of 400 lb. of steel per hour at 30 kw., delivering 25 gal. of oil per minute at a temperature up to 600 deg. F.

Ornamental Streethoods. — Two new "Multilux" street hoods designed for use with Holophane two-way and four-way refractors, as well as with the Westinghouse-Holophane "Bi-Lux" refractor or "Luxsolite" globes, have been placed on the market by the Westinghouse Electric & Manufacturing Company. They consist of an ornamental cast-iron body made up of two parts, cap and skirt. All joints are carefully sealed, making the complete unit dust-proof, bug-poof and rain-proof. This type of street hood is particularly adapted for use in smaller communities where ornamental units mounted on standards are unsuitable. When used with ornamental crooks they make an inexpensive and effective lighting unit.

Mill and Crane Control.—A mill and crane magnetic time control especially designed for use with steel-mill auxiliaries and cranes and hoists has been placed on the market by the General Electric Company. This control is adapted to the use of the steel industry and for other industrial activities where reversing and non-reversing direct-current motors are used. A time-limit scheme of acceleration is provided when starting, and current limit for plugging when reversing. These controls are provided with instantaneous electrical reset overload relays.

New Trade Literature

SINE-WAVE GENERATOR. — Bulletin No. 42,567 issued by the General Electric Company, Schenectady, N. Y., describes its sine-wave generator. It contains photographs, charts, diagrams and tables. Different testing applications of the generator are also explained.

INSULATING MATERIALS.—The John C. Dolph Company, 168 Emmett Street, Newark, N. J., is distributing a folder describing its "Chinalak" black-baking insulator. Attention is also called to its electric lacquer (air-drying) black-finishing insulating varnish.

MOTOR MAINTENANCE EQUIPMENT. —The Martindale Electric Company, Box 35, Lakewood Station, Cleveland, Ohio, has issued catalog No. 6, covering its commutator slotting and grinding equipment and motor maintenance specialties for use in power plants, electric railways, industrial plants, office buildings, etc.

CIRCUIT BREAKER.—The Cutter Company, Philadelphia, has issued a booklet entitled "A Nail That Cost $1,000," which calls attention to the use of the "U-Re-Lite" with electric motors. The device is primarily an appliance for the protection from overloading of electric motors and power or lighting circuits.

ILLUMINATING DATA.—A booklet has been issued by Curtis Lighting, Inc., 1119 West Jackson Boulevard, Chicago, entitled "The Opportunity in Illumination," in which it describes its course for illuminating engineers.

DIRECT-CURRENT AUTOMATIC STARTERS. — The Industrial Controller Company, Milwaukee, is distributing bulletins Nos. 7,100C and 7,107C, describing the "I-C" Class 7,107, 7,120 and 7,130 direct-current automatic starters provided with time-limit acceleration.

CONVERTIBLE POWER PANEL. — The Square D Company, Detroit, is distributing a folder covering its convertible power panel, which permits adjustment of the spacing of the fuse jaws to provide for 30, 60 or 100-amp. fuses.

ELECTRIC FANS.—The Galvin Electric Manufacturing Company, St. Louis, is distributing a folder calling attention to the various types of the Galvin electric fans, including desk and wall fans, oscillating and non-oscillating, of the universal type for direct or alternating current.

CONDULETS.—The Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin No. 2,070, describing its various types of condulets for stocks-bin installations. Illustrations are given showing typical arrangements of stock bins and a day and a night view of a stock-bin condulet installation.

SQUIRREL-CAGE INDUCTION MOTORS.—Bulletin No. 100 issued by the Linzee Electric Motor Company, Mansfield, Ohio, describes and illustrates the new type LB ball-bearing and type LS sleeve-bearing Linzee squirrel-cage induction motors.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Vienna, Austria (No. 14,303), for automobile accessories, such as magnetos, spark plugs and lamps.

Purchase is desired in Sydney, Australia (No. 14,211), of storage batteries.

Purchase is desired in Melbourne, Australia (No. 14,212), of copper connecting sleeves.

An agency is desired in Berlin, Germany (No. 14,213), for electric laundry machines, vacuum cleaners, floor-cleaning machines, etc.

Purchase and agency is desired in Vienna, Austria (No. 14,246), for electrical hair-drying apparatus.

Purchase and agency is desired in Winnipeg, Canada (No. 14,315), for radio apparatus, including headsets.

An agency is desired in Rome, Italy (No. 14,216), for radio sets.

Purchase is desired in Stockholm, Sweden (No. 14,217), of an electric tractor for hospitals.

Purchase is desired in Melbourne, Australia (No. 14,306), of portable, petrol-driven welding plant, complete with accessories; (No. 14,307) of centrifugal electric-driven exhaust fans, complete with electrical equipment; (14,304) of a high-speed turbine lathe and electrical equipment.

An agency is desired in Tokyo, Japan (No. 14,209), for portable electric hammers.

An agency is desired in Florence, Italy (No. 14,214), for radio apparatus.

An agency is desired in Bucharest, Rumania (No. 14,250), for brass, bronze, copper, lead and zinc.

New Incorporations

THE METZ (IND.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $2,000 to furnish electricity. The company will also deal in electrical fixtures. The directors are George Sutton, Samuel Kohl, Shirley Fee, Maurice Kinter and Theodore Dunham.

THE LEWIS CREEK (IND.) ELECTRIC COMPANY has been incorporated with a capital stock of $5,000 by Charles H. Perry, George W. Ropp, Jr., Herman Weinantz, E. Hawkins and Clarence Hawkins.

THE CHAMPLAIN POWER CORPORATION, Plattsburgh, N. Y., has been chartered to construct hydro-electric plants. The capital consist of 1,000 shares, no par value. The incorporators are J. T. Taaffe, 914 Park Avenue, Albany; Frank C. Agnew, 44 Elm Street, Plattsburg, and Charles F. Polk, 220 Sixteenth Street, Watervliet.

THE CARTHAGE POWER CORPORATION, New York City, has filed certificate of incorporation with the Secretary of State with a capital of 10,000 shares of no par value. The company contemplates an extensive power development on the Black River in the vicinity of Carthage. The directors are: F. L. Carlisle, W. H. Versfiet and R. K. Ferguson, 49 Wall Street, New York City.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

BLANFORD, MASS. — Plans are under way to establish an electric lighting system here. It is proposed to erect a transmission line from the Russell-Blanford town line to secure the service.

BOSTON, MASS.—The installation of an ornamental lighting system on several streets in the Dorchester section, to cost about $25,000, is under consideration. J. A. Rourke is commissioner of the Department of Public Works.

WORCESTER, MASS.—The City Council has filed plans for the construction of a fire-alarm station at Newton Hill, to cost about $70,000.

NEW HAVEN, CONN. — The United Illuminating Company plans to build an addition to its substation at Washington and Spring Streets.

Middle Atlantic States

NEW YORK, N. Y.—Bids will be received by the Superintendent of School Buildings, Board of Education of the City of New York, Flatbush Avenue Extension and Concord Street, Brooklyn, until April 13, for installing two electric elevators in the New York Training School for Teachers, on Convent Avenue, from Convent Avenue to St. Nichols Terrace.

ELIZABETHTOWN, N. Y.—The Public Service Commission has authorized J. Lawrence Webster to exercise an electric franchise in Elizabethtown. Mr. Webster is now serving the village and part of the town. He now proposes to erect a transmission line to New Russia.

GOWANDA, N. Y.—The Iroquois Utilities, Inc., Syracuse plans to erect a transmission line from Gowanda to Cold Springs, Randolph, East Otto, Little Valley and Napoli, for local commercial service. Franchises have been granted.

JAMAICA, N. Y.—Bids will be received by the Superintendent of School Buildings, Flatbush Avenue Extension and Concord Street, until April 13 for electric wiring and fittings for Jamaica High School on Grand and Chapin Avenues.

JAMESTOWN, N. Y.—The City Council is planning to place all overhead wires on Second Street in underground conduits and also to install an ornamental lighting system on that thoroughfare.

PORT LEYDEN, N. Y. — The Public Service Commission has granted the Northern New York Utilities, Inc., Watertown, permission to exercise an electric franchise in Port Leyden and to construct the necessary transmission and distribution lines in the town of Leyden and village of Port Leyden. The project includes a transmission line 5 miles long.

MIDDLETOWN, N. Y. — The Orange County Public Service Company, Inc., has been granted a franchise to erect a transmission line to supply electricity to State Hill, Johnson, Weston and Unionville.

NEW YORK, N. Y.—The United States District Engineer, United States Army, will ask bids at an early date, for the installation of an electric lighting system in the MacDonough Memorial.

ROXBURY, N. Y.—Permission has been granted the New York State Gas & Electric Corporation, Ithaca, to lease the transmission and distribution systems of the Tri-County Light & Power Company, Stamford. The lease covers a transmission line from near Pratteville through Grand Gorge, in the town of Roxbury, to Stamford, with branches extending into the town of Gilboa, and easterly from Grand Gorge, and distributing systems in Grand Gorge, Gilboa and other rural communities in this territory.

SCOTLAND, N. Y.—The Municipal Gas Company, Albany, has petitioned for approval of an electric franchise granted by the Town Council and for permission to extend its lines in the town.

SENECA FALLS, N. Y.—Plans are under way for installing an electric lighting system at the Seneca County Home, 3 miles south of here, to replace the present acetylene lamps. Electricity will also be used for pumping and power purposes. The Empire Gas & Electric Company, Geneva, will extend its line from here to furnish the service.

BELMAR, N. J. — The Jersey Central Power & Light Company has been reorganized to take over and consolidate the Lakewood & Coast Electric Company, Toms River Electric Company, Central Jersey Power & Light Company, Tri-County Electric Company, Monmouth Lighting Company, and the Shore Lighting Company. Plans are under way for extensions in transmission lines for interchange of power between the different territories; new substations will be built.

TRENTON, N. J.—Bids will be received by the Board of Commissioners of the City of Trenton until April 10 for construction of sewage treatment works, including the installation of pumps, motors, generators, tanks, sludge beds, wiring, etc. The equipment will include six 20-in. centrifugal pumps and motors, two motor-generators, power board control and connections, valves, pipings, etc.; electric crane, gasoline locomotive, industrial railroad and cars and buildings complete. George A. Johnson and George L. Watson, 150 Nassau Street, New York City, are associated consulting engineers. A. C. Gregory, Trenton, is engineer of sewers.

MARCUS HOOK, PA.—Plans for proposed extension to the local artificial silk mill of the Viscose Company of America, Inc., to cost about $3,000,000 include extensions to power house and the installation of electric power equipment. The Ballinger Company, Twelfth and Chestnut Streets, Philadelphia, is architect and engineer.

BALTIMORE, MD.—Bids, it is reported, will soon be asked by the Gold Dust Corporation, 239 West Thirtieth Street, New York, for the construction of a power plant at its new local factory to cost about $750,000. The equipment will include boilers of 1,000 hp., coal and ash-handling machinery, electrical equipment, refrigerating apparatus, etc. Lockwood, Greene & Company, 100 East Forty-second Street, New York, are architects and engineers.

CUMBERLAND, MD. — Arrangements have been made by the Potomac Edison Company, Washington, D. C., for the construction of new distributing station in connection with its river plant along the Kelly Boulevard. It will cost about $200,000 and will replace the Union Street substation, which will eventually be dismantled.

NORFOLK, VA.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until

April 7, for 121 knife switches (Schedule 3525).

QUANTICO, VA. — The Supply Office, Navy Yard, Washington, D. C., has been authorized to make arrangements for the installation of a fire alarm system at the local yard.

WASHINGTON, D. C.—Bids will be received by the General Purchasing Officer, Panama Canal, Washington, until April 8, for 5,500 ft. interior communicating cable (Panama Circular 2379).

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, Washington, until April 7, for 460,000 ft. house wire (Circular CP 20452-15).

North Central States

ALLEGAN, MICH.—At an election to be held April 5 the proposal to issue $8,000 in bonds for the installation of ornamental lamps will be submitted to the voters.

CENTRAL LAKE, MICH.—The City Council is considering the erection of a transmission line for local service, to cost about $15,000.

FERNDALE, MICH.—The City Council contemplates extensions and improvements in the municipal street-lighting system, to cost about $50,000.

CLEVELAND, OHIO.—Bids will be received at the office of the Commissioner of Purchases and Supplies, City Hall, until April 10 for suspension type street lighting fixtures, motor generator sets and for boilers and hoppers for the Division of Light and Power. Separate bids to be submitted on each item.

CLEVELAND, OHIO.—The Cleveland Electric Illuminating Company is considering the construction of an equipment storage and distributing building at Clarkwood Street and the Pennsylvania Railroad.

RUSSELL, KY.—The Chesapeake & Ohio Railroad Company, Richmond, Va., plans to build a power house in connection with its proposed local locomotive shops, to cost about $1,000,000.

THORNTON, KY.—The Elkhorn Collieries Company plans to rebuild its power plant, recently destroyed by fire, with loss of about $50,000.

ALTON, ILL.—The Illinois Glass Company plans to build a power plant in connection with extensions to its local works, to cost about $500,000. The Jackson & Morehead Company, 31 James Avenue, Boston, is architect and engineer.

DECATUR, ILL.—The Illinois Power & Light Corporation, Chicago, plans to build a local warehouse and distributing plant, to cost about $125,000.

EAST ST. LOUIS, ILL.—The Illinois Power & Traction Corporation, Chicago has acquired the property of the St. Louis, Troy & Eastern Railroad Company, which runs from East St. Louis to Troy. The road, it is understood, will be equipped for electrical operation. Two substations will be erected near Edwardsville.

FARMER CITY, ILL. — Improvements are contemplated to the municipal electric light plant and waterworks during the coming summer, including the installation of one 250-kw. three-phase, 60-cycle, 2,300-volt generator, one Chuse engine; also one 12-in. well, 176 ft. deep, with either steam or electrically driven pumps. Charles McMurphy is chief engineer.

MOLINE, ILL.—Work has started by the Peoples Power Company on the erection of a 15,000-volt transmission line from East Moline to the plants of the new gypsum company near Cordova. The line will cost about $25,000 and will supply electricity to the gypsum works, of which the first unit is now being erected at a cost of about $250,000.

MOUNT CARMEL, ILL. — The Mount Carmel Public Utility & Service Company may possibly install a new 750-kw., 2,400-volt turbine with surface condenser this year. P. Barnhard is president and general manager.

MURPHYSBORO, ILL.—The Mobile & Ohio Railroad Company, Mobile, Ala., plans to install electric power equipment in connection with the rebuilding of its local car and locomotive repair shops, recently destroyed, with loss of about $500,000.

GREEN BAY, WIS.—Plans have been adopted by the City Park Commission for the installation of an ornamental lighting system in Union Park. Plans are also being prepared to replace the present lamps in Bay View Beach Park with ornamental standards.

GREEN BAY, WIS.—Plans are under way by the Northern Paper Mills Company for the construction of a new power house on the Peshtigo River and the erection of a new transmission line from there to Green Bay to supply electricity for its local plant.

RUDOLPH, WIS. — Steps have been taken by the Lone Birch Community Club for the erection of a transmission line from Biron to Rudolph to supply electrical service to the farming communities along the proposed line.

BUHL, MINN.—The Village Council is planning a bond issue of $100,000, for extensions to the municipal electric light and power plant.

MINNEAPOLIS, MINN.—The Intersectional Realty Company, 816 Second Avenue, South, plans to built an electric power plant at Twelfth and Marquette Streets, to cost about $100,000. Larson & MacLaren are architects.

MINNEAPOLIS, MINN.—Bids will be received by F. S. Cram, city purchasing agent, City Hall, until April 20, for construction, including plumbing, heating and electric work for the new municipal auditorium building. The cost is estimated at $3,000,000. Croft & Boerner, Inc., 1004 Marquette Avenue, are architects.

ST. PAUL, MINN.—Bids will be received by H. W. Austin, city purchasing agent, until April 7 for installing an electric lighting system on Fifth Street from St. Peter to Fourth Street, on Portland Avenue and Central Park Place.

ADEL, IOWA.—Plans are under way by the Adel Light & Power Company for the construction of a new 600-hp. electric plant, to cost between $45,000 and $50,000. The new plant will be located directly across the river from the present station.

AREDALE, IOWA.—At a recent election bonds were authorized for the installation of an electric distributing system.

LITTLE ROCK, IOWA.—At a special election held recently the proposal to sell the municipal electric plant to the Northwestern Light & Power Company, Mayville, Wis., was carried. Work, it is understood, will begin at once on improvements to the system.

NEVADA, IOWA.—Application has been made by the Iowa Railway & Light Company for a franchise to erect a new high-tension transmission line from Nevada to Fernald and to Richard. The company plans to furnish electrical service to farmers along the line as well as in the two towns.

SAVANNAH, MO.—Plans are being prepared for the construction of a power plant at Dr. Nichols' Sanitorium. Thomas, McLennan & Thomas, 525 Seventeenth Street, Des Moines, Iowa, are architects.

ROSALIE, NEB.—Bonds to the amount of $17,000 have been authorized for the erection of a transmission line for local service and for improvements to the distribution system. Grant, Fulton & Letton, 525 South Thirteenth Street, Lincoln, are engineers.

Southern States

GREENSBORO, N. C.—Contract has been awarded by the City Council for the construction of transmission lines from the city to the new water works plant at Abbott Creek, a distance of about 5 miles, to cost $9,000.

GREENSBORO, N. C.—Arrangements are being made by the North Carolina Public Service Company for erecting a 13,000-volt transmission line to Summerfield and Stokesdale with substations at each place, at a total cost of from $45,000 to $50,000.

POLLOKSVILLE, N. C.—The Neuse River Electric Company, New Bern, plans to erect a transmission line to Polloksville, to furnish service here.

LOUISVILLE, GA.—The installation of an ornamental street-lighting system is under consideration by the Water and Light Committee. M. A. Cox is superintendent.

LAKE WORTH, FLA.—The installation of an 850-kw. generator and the erection of a 6,600-volt transmission line to Boynton, a distance of about 6 miles, is under consideration by the Municipal Water and Light Department. George Kingsley is manager.

PAGOSA SPRINGS, FLA. — The New Light & Power Company is considering the installation of an oil engine-driven generating unit of 150 hp. capacity. J. L. Giger is manager.

SARASOTA, FLA.—The City Council is considering the purchase of power (from 1,200 to 1,500 hp.) for the municipal electric light system. J. R. Hurton is superintendent.

STARKE, FLA. — Arrangements are being made by the Board of Bond Trustees to extend the municipal electric lines to Lawty to furnish service there. R. F. Clark is superintendent.

VERO, FLA.—Bonds to the amount of $100,000 have been voted for extensions and improvements to the municipal electric power plant, and street-lighting system.

HARRIMAN, TENN.—The City Council has engaged Robert & Company, Atlanta, Ga., engineers, to make surveys of the municipal electric plant and distribution system in connection with the proposals submitted by the Tennessee Electric Company, Chattanooga, for the purchase of the plant and system, and the Roane Iron Company, Rockwood, to furnish power to operate the local system.

FAYETTEVILLE, ARK. — The question of calling an election to vote on the proposal to issue $200,000 in bonds to establish a municipal electric plant is under consideration by the City Council.

LEACHVILLE, ARK. — The Leachville Light & Ice Company contemplates the construction of a transmission line from Manilla to Leachville.

NEW ORLEANS, LA.—Bids will be received by the Board of Port Commissioners for furnishing and installing an electric interlocking plant complete at the crossing of the Louisiana & Navigation Railway at the International Harbor Canal, to cost about $30,000.

HOLDENVILLE, OKLA.—The Oklahoma Light & Power Company contemplates improvements in its local electric power plant, to cost about $17,000.

MORRISON, OKLA.—The Oklahoma Gas & Electric Company, Oklahoma City, has been granted a franchise to erect a transmission line for local service.

TONKAWA, OKLA.—Extensions and improvements in the municipal electric lighting system, to cost about $10,000 are under consideration. The Ruckel Engineering Company, Interurban Building, Hutchinson, Kan., is engineer.

CHILDRESS, TEX.—Extensions are being made by the Texas Central Power Company, San Antonio, to cost about $250,000. Transmission lines will be erected from this plant to Clarendon, 56 miles, and to Kirkland and Acme, east, 21 miles.

DALLAS, TEX.—Plans are being prepared by the Dallas Power & Light Company for extensions to its system involving an expenditure of about $2,000,000. The work will include the installation of an additional 20,000-kw. turbo-generator complete with auxiliary equipment and a new building adjoining the present plant to house the new equipment.

HUNTSVILLE, TEX.—A franchise has been granted to the Western Public Service Company, Colorado Springs, to erect transmission lines along the public roads of the county. The company recently acquired the electric plant of the Huntsville Cotton Oil Company.

PANHANDLE, TEX. — Bonds to the amount of $35,000 have been voted for the installation of a municipal electric light and power system.

Pacific and Mountain States

PORT ANGELES, WASH.—The Northwestern Power & Manufacturing Company has applied for permission to use 500 second ft. of water of the Elwha River in Clallam County. The company proposes to develop 7,500 hp. at a cost of about $800,000. The plans include an impounding dam 160 ft. high and 400 ft. long.

STEILACOOM, WASH. — The Cascade Paper Company, Tribune Building, Tacoma, plans to build a power house in connection with a proposed local pulp mill, to cost about $450,000.

TACOMA, WASH.—The City Council is considering extensions and improvements in the municipal light and power system, to cost about $100,000.

REEDSPORT, ORE.—The West Coast Power Company, Portland, recently organized, has acquired the properties of the General Light & Power Company, which serves Newport and Toledo, Ore., and Shelton, Wash.; the Waldport (Ore.) Lighting Company; the Florence (Ore.) Electric Company, and the Shorey Light & Power

Company, Reedsport. Plans are under way for the erection of a 22,000-volt transmission line, 31 miles long, to connect Florence and Reedsport, and the installation of a 750-kw. steam plant at Reedsport this year. Later the company plans to tie in the Newport and Waldport properties, and eventually connecting its entire Oregon system by a line from Waldport to Florence.

SALEM, ORE. — The Portland Electric Company, Portland, contemplates the construction of a local substation to be equipped primarily for switching service.

FRESNO, Cal.—Plans have been prepared for the installation of an ornamental lighting system on portions of Dudley and Olive Avenues, using cast steel standards, to cost about $25,000. W. Stranahan is city engineer.

HAWTHORNE, CAL.—The installation of a street lighting system on Hawthorne Avenue, Raymond, Acadia Streets, to cost about $25,000, is under consideration. V. H. Stahell is city engineer.

OAKLAND, CAL.—The Board of Supervisors of Alameda County will soon take bids for the construction of a power house at Fourteenth Avenue and East Twenty-seventh Street, in connection with a garage, shop and other mechanical buildings. The total cost is estimated at $200,000. H. H. Meyers, Kohl Building, San Francisco, is architect.

SACRAMENTO, CAL.—Plans for the proposed local sugar refinery to be built by the Northwestern Sugar Refining Company, Bank of Italy Building, Oakland, to cost about $1,000,000, include a power plant. W. H. Ellison, Pacific Building, San Francisco, is engineer.

SEAL BEACH, CAL.—The Los Angeles (Cal.) Gas & Electric Corporation has applied for a franchise for the construction of lines, with conduit system in portions of the Orange County Road and the Long Beach-Naples Highway.

SOUTH PASADENA, CAL.—The City Council plans to install an ornamental lighting system on Bonita Drive, from Meridan Avenue to Gilleté Crescent, using concrete standards.

VENICE, CAL.—The installation of an ornamental lighting system on Ocean Front Avenue, using ornamental iron and concrete standards is under consideration by the City Council.

PHOENIX, ARIZ.—The Salt River Valley Water Users' Association will hold an election on April 7 to vote on the proposal to issue $450,000 in bonds to provide additional pumping facilities for the Salt River project.

TUCSON, ARIZ.—Plans have been filed by the Tucson Gas, Electric Light & Power Company for an addition to its power plant at Sixth Street and Tenth Avenue.

BOISE, IDAHO. — The installation of from twenty-five to fifty lamps on approach to the new railway station is under consideration by the managers of the municipal electric light plant. C. C. Stevenson is city engineer.

CHINOOK, MONT.—Plans for the proposed local sugar mill to be built by the Utah-Idaho Sugar Company, Salt Lake City, to cost about $1,000,000, include a power plant.

AGUILAR, COL.—The erection of about 2 miles of rural line extensions is under consideration by the Aguilar Light & Power Company. William M. Letcher is superintendent.

GLENWOOD SPRINGS, COL. — The Glenwood Light & Water Company contemplates the erection of 2 miles of rural lines. F. W. Kaiser is general manager.

Canada

ALICE ARM, B. C.—Arrangements are being made by the Alice Arm Hydro Electric Company for the construction of a hydroelectric plant at Falls Creek in Alice Arm. R. Armour and E. R. Workman, Anyox, are interested in the project.

HAMILTON, ONT.—Plans are being prepared by the Hamilton Hydro-Electric System for a substation, to be erected on Hughson Street North, to cost about $200,000. E. I. Sifton is manager.

PORT COLBURNE, ONT.—Plans are being considered by the Hydro-Electric Power Commission of Ontario, Toronto, to extend its transmission lines 10 miles west from here. The cost is estimated at $50,000.

NOMININQUE, QUE.—Plans are under consideration by D. J. Valiquetti for a water power development and electric system, to cost about $25,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued March 3, 1925)

1,528,735. THERMIONIC-TUBE CONSTRUCTION; F. S. McCullough, Wilkinsburg, Pa. App. filed June 2, 1924.

(Issued March 10, 1925)

16,019 (reissue). SWITCH; E. H. Jacobs, Chicago, Ill. App. filed July 26, 1922. Disconnect.

1,528,746. TELEPHONE-EXCHANGE SYSTEM; W. P. Albert, East Orange, N. J. App. filed April 13, 1921. Automatic.

1,528,751. TELEPHONE TRUNKING SYSTEM; J. I. Bellamy & J. Wicks, Chicago, Ill. App. filed April 5, 1922.

1,528,754. PORTABLE LIGHTING APPARATUS; M. Bresson, Douai, France. App. filed Jan. 23, 1924.

1,528,761. AUTOMATIC TELEPHONE SWITCH; H. W. Goff, New York, N. Y. App. filed May 29, 1922.

1,528,763. SWITCHING DEVICE; C. L. Goodrum and C. J. Hendrickson, New York, N. Y. App. filed May 2, 1922. For making telephone connections.

1,528,767. SWITCHING DEVICE; C. J. Hendrickson, New York, N. Y. App. filed April 27, 1922. For telephone systems.

1,528,772. ELECTRICAL ARRANGEMENT FOR THE TELECONTROL OF GUNS OR THE LIKE; P. Kaminski, Berlin-Pankow, Germany. App. filed Jan. 27, 1921.

1,528,773. ARRANGEMENT FOR THE CONTROLLING OF ASYNCHRONOUS MACHINES; J. Kozisek, Charlottenburg, Berlin, Germany. App. filed Aug. 23, 1921.

1,528,791. AUTOMATIC SWITCHING APPARATUS; C. D. Richard, New Brighton, N. Y. App. filed May 25, 1922. For automatic telephone exchange system.

1,528,792. AUTOMATIC TELEPHONE SYSTEM; R. G. Richardson, Chicago, Ill. App. filed Feb. 13, 1920.

1,528,795. CIRCUIT INTERRUPTER; W. Schwagermann, Yonkers, N. Y. App. filed March 24, 1920. Using a barrier between contacts so as to rupture heavy currents without serious arcing or material deterioration of the contacts.

1,528,796. RING-POLE MAGNETIC CHUCK AND THE LIKE; F. L. Simmons, Woonsocket, R. I. App. filed March 25, 1920.

1,528,806. TELEPHONE-EXCHANGE SYSTEM; R. S. Wilbur, Lyndhurst, N. J., and C. White, East Orange, N. J. App. filed Jan. 3, 1921. Machine switching.

1,528,811. ELECTRIC POCKET LAMP; M. Zeiler, Berlin-Treptow, Germany. App. filed Sept. 27, 1923.

1,528,844. AUTOMATIC AIR AND OIL BREAK ELECTRIC SWITCH; G. Pailin, Manchester, England. App. filed Aug. 8, 1922.

1,528,865. TESTING DEVICE FOR ELECTRIC CIRCUITS; O. Wilcke, Friedrichshafen, Germany. App. filed June 28, 1920. Especially the circuits of bomb-throwing installations controlled by electromagnets.

1,528,871. FIXTURE CHAIN; R. B. Benjamin, Chicago, Ill. App. filed June 5, 1920.

1,528,877. ADJUSTABLE REEL FOR ELECTRICAL CONDUCTORS; H. L. Hayden, Whitefish, Mont. and A. N. Sanford, Vashon, Wash. App. filed April 19, 1920.

1,528,878, 1,528,879. ELECTRIC ARC-WELDING ELECTRODE; C. J. Holslag, South Orange, N. J. App. filed Oct. 15, 1918. Metallic.

1,528,886. RAIL BOND; F. H. Neff, Cleveland, Ohio. App. filed Nov. 4, 1918.

1,528,900. HIGH-TENSION OVERFLOW-CURRENT SWITCH FOR SMALL INTENSITIES OF CURRENT; M. Vogelsang, Frankfort-on-the-Main, Germany. App. filed Aug. 24, 1921. Of the horn-switch type.

1,528,907. TRUNKING SYSTEM; H. M. Bascom, Brooklyn, N. Y. App. filed Feb. 26, 1921. For telephone-exchange system.

1,528,920. TRUNKING SYSTEM; R. M. Foster, Brooklyn, N. Y. App. filed Feb. 26, 1921. For telephone-exchange system.

1,528,948. ELECTRIC HEATING DEVICE; A. B. Pruden, Flushing, N. Y. App. filed Feb. 29, 1924.

1,528,962. TESTING DEVICE; E. A. Woehlke, Markesan, Wis. App. filed May 13, 1922. For magnetos.

1,528,963. GRID FOR STORAGE-BATTERY PLATES; E. S. Adams and W. H. Adams, Columbus, Ohio. App. filed Aug. 19, 1920.

1,528,975. ELECTRIC CIGAR LIGHTER; A. C. Gruhlke, Waterloo, Ind. App. filed June 4, 1923.

1,528,982. TRUNKING SYSTEM; E. C. Molina, East Orange, N. J. App. filed Feb. 26, 1921. For telephone-exchange system.

1,528,990. METERING PANELBOARD; H. F. Richardson, Brooklyn, N. Y. App. filed Oct. 27, 1920.

1,529,065. SYSTEM OF RADIO CONTROL; J. H. Hammond, Jr., Gloucester, Mass. App. filed Dec. 11, 1916.

1,529,083. PROCESS OF COATING IRON AND STEEL SHAPES WITH OTHER METALS; S. Peacock, Wheeling, W. Va. App. filed June 7, 1922.

1,529,124. BATTERY BOX; A. A. Glidden and J. E. Perrault, Watertown, Mass. App. filed Sept. 19, 1922.

1,529,151. CONTROLLING SYSTEM; W. P. Albert, East Orange, N. J. App. filed June 20, 1922. For telephone and similar systems.

1,529,171. TELEPHONE-EXCHANGE SYSTEM; J. F. Dahl, East Orange, N. J. App. filed Dec. 30, 1922. Comprising manual and automatic exchanges.

1,529,184. ELECTRIC SWITCH UNIT; D. M. Johnston, Camillus, N. Y. App. filed March 1, 1922. Mountable between the base and the cap of an electric fixture.

1,529,200. ELECTRIC HEATER; J. F. Mercer, Globe, Ariz. App. filed Nov. 26, 1923. For liquids.

1,529,216. FUSED SWITCH; J. Sachs, Hartford, Conn. App. filed Jan. 25, 1923. Knife-blade switch; blades mechanically joined but electrically separated by insulation, with a clip for an inclosed fuse electrically connected with each blade.

1,529,217. MAGAZINE SCREW-PLUG FUSE; J. Sachs, Hartford, Conn. App. filed Feb. 26, 1923.

1,529,220. ELECTRIC CONTROLLER; C. S. Schroeder, Stamford, Conn. App. filed Oct. 28, 1921. Of the drum type.

1,529,244. BINDING POST; H. H. Eby Philadelphia, Pa. App. filed Jan. 4, 1924.

1,529,249. METHOD OF AND APPARATUS FOR ELECTRODEPOSITION AND THE PRODUCT THEREOF; H. D. Gue, Brooklyn, N. Y. App. filed May 19, 1923.

1,529,259. GLASS; F. M. Locke and F. J. Locke, Victor, N. Y. App. filed Dec. 9, 1922. Will act as a high-voltage insulator at high temperatures.

1,529,262. PETTICOAT INSULATOR; R. MacEachen, Washington, D. C. App. filed April 28, 1923. For use on the lid of a storage-battery case of a miner's electric portable or safety lamp.

1,529,266. LAMP SHADE FOR USE WITH INCANDESCENT ELECTRIC LAMPS; J. Mersing, Switzerland. App. filed Dec. 12, 1923.

1,529,276. BURGLAR TRAP; A. A. Rich, Hamilton, Ohio. App. filed May 14, 1921.

1,529,279. CLAMP FOR BATTERY TERMINALS; M. C. St. John, Chicago, Ill. App. filed Sept. 21, 1921.

1,529,288. ELECTRIC STARTING MOTOR FOR POWER ENGINES; H. Baumeister, Berlin-Pankow, Germany. App. filed May 13, 1922.

1,529,318. ELECTRIC SHIP PROPULSION; C. Macmillan, Schnectady, N. Y. App. filed Sept. 23, 1921.

1,529,323. CLOSED-ARC LAMP; F. Skaupy and W. Zebrowski, Berlin, Germany. App. filed April 19, 1924. Tungsten type.

1,529,325. SYSTEM OF ELECTRIC DISTRIBUTION; G. E. Stewart, Philadelphia, Pa. App. filed Jan. 28, 1924. Automatic generator cut-in system for automatic substation.

1,529,328. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; O. C. Traver, Schenectady, N. Y. App. filed Jan. 19, 1922.

1,529,331. ELECTRIC CLOCK SYSTEM; H. E. Warren, Ashland, Mass. App. filed May 16, 1924.

1,529,332. ELECTRIC SWITCH; E. B. Wedmore, Golder's Green, England. App. filed April 14, 1920. Oil type having auxiliary contacts.

1,529,341. MECHANICAL RECTIFIER; J. L. Burnham, Schenectady, N. Y. App. filed Dec. 1, 1920. Rotary converter.

1,529,342. AUTOMATIC ELECTRIC TOASTER; S. Christy, Des Moines, Ia. App. filed May 14, 1923. Restaurant type.

1,529,343. TELEPHONE TRANSMITTER; W. H. Clayton, Pine Bluff, Ark. App. filed July 18, 1923.

1,529,363. ELECTRIC LIGHT FIXTURE; J. Markel and I. P. Smith, Buffalo, N. Y. App. filed Sept. 15, 1924. Combination fixture of the wall-bracket type.

1,529,368. ELECTRIC FURNACE; H. A. Mulvany and H. E. Kennedy, Berkeley, Cal. App. filed Oct. 5, 1921. Method of supporting the heating elements.

1,529,419. TELEPHONE SYSTEM; G. A. Betulander, Stockholm, Sweden. App. filed March 1, 1923. Automatic and semi-automatic system.

1,529,433. SIGNALING SYSTEM; R. M. Hopkins, Rutherford, N. J. App. filed July 5, 1919. Alarm system or detection system.

1,529,436. AUTOMATIC CUT-OUT SYSTEM FOR SYNCHRONOUS DRIVES; O. E. Kellum, Los Angeles, Cal. App. filed Sept. 18, 1920.

1,529,448. LIGHTING FIXTURE; J. K. Riddle, Toledo, Ohio. App. filed July 18, 1924.

Financial and Corporate

Utility Stocks Weaken

Decline in General Market Brings Moderate Losses to Power Group

CONTINUED reaction in the general market for stocks, followed by selling on Monday that carried 140 issues on the New York Stock Exchange to fresh low levels for the year, naturally has had its effects upon power and light stocks. While the utility shares did not break in the manner that many other types of stocks broke, they nevertheless worked into somewhat lower levels during the week. Evidences point to the conclusion that the hesitation in the market for utility stocks nowadays results more from the position of the general markets than from any fundamental change in the power and light situation.

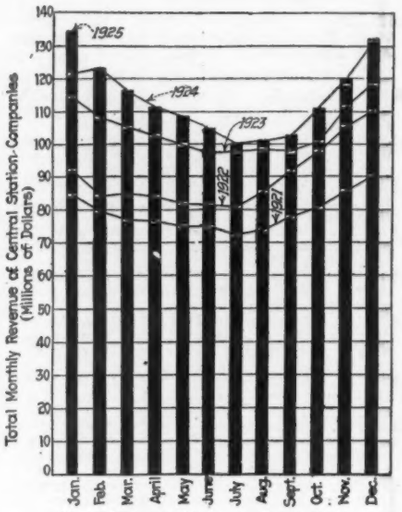
In the week under review power and light stocks generally did not lose so much as might have been expected from a review of the markets in railroad and industrial shares. Losses of a point or two were pretty general, but losses of more than that were the exception rather than the rule. American Power & Light Company's stock, for example, lost only a point, and American Gas & Electric Company's stock fell off two points. Among the more important stocks that declined something like a point during the week were American Light & Traction, Electric Investors, Inc., Electric Railway Securities, Lehigh Power Securities and Western Power.

One of the sharpest losses suffered by any issue during the week was the three-point decline of the Middle West Utilities Company. This stock earlier in the year had a sharp advance at a time that many stocks were losing ground on reports of improved earnings and the possibility of the declaration of an initial dividend this year. Among the listed stocks of the power and light group there have been declines, but even on the big board the utility declines have been moderate.

New Revenue Record Established During January

Reports received by the ELECTRICAL WORLD from central-station companies representing 78 per cent of the generator rating of the country indicate that the total gross revenue from the sale of energy during January was $134,700,000, or a daily average of $4,470,000, an increase of 10.8 per cent over January, 1924, and one which sets a new record in central-station revenue.

Following the usual seasonal trend, the revenue during the month of January showed a material increase over that reported for December. The revenue was 11.3 per cent above the estimated normal for the month. Every section of the country reported revenue above that for the same month of 1924. The operating expenses during January totaled $56,800,000, against $53,350,000 for January, 1924.



NEW RECORD SET IN CENTRAL-STATION REVENUE

General Electric Reports Substantial Increase in Sales

The thirty-third annual report of the General Electric Company covering the year 1924 showed net sales billed amounting to $299,251,869, as compared with $271,309,695 for the year 1923. The total income was $45,135,683, representing an increase of approximately 19 per cent over that recorded for the previous year. Six per cent cash dividends on the special stock, amounting to $1,195,405, and 8 per cent cash dividends on the common stock left a surplus in excess of cash dividends of $23,635,162. This figure compares with $18,579,423 in 1923. The number of stockholders on December 3, 1924, totaled 37,716, of whom 45 per cent were women. The average number of common shares held by the stockholders was fifty-five. Orders received during the year were $283,107,697, compared with $304,199,746 in 1923, a decrease of 7 per cent. Unfilled orders at the end of the year were $68,958,000, compared with $87,112,000 at the end of 1923.

Power Corporation of New York Is Active

Its Name Linked with Possible New Power Deal—Controls Large Undeveloped Water Powers—Initial Dividend Has Been Declared on Common

BY PAUL WILLARD GARRETT

MENTION of the Power Corporation of New York in connection with a new power deal said to be under consideration and involving different systems in northern New York State follows the news not long ago that the Power Corporation had declared an initial dividend on its common stock.

Although comparatively young in years itself, the Power Corporation has control of numerous old properties and ranks among the more important power and light utilities of its section of the country. The system is established in northern New York State between the Adirondacks and Lake Ontario. It controls developed water-power resources to the amount of 175,800 hp., and in addition has undeveloped hydro-electric resources aggregating 130,400 hp., thus making a total of 306,200 hp.

The principal subsidiary of the Power Corporation of New York is the Northern New York Utilities, Inc., an old-established power and light company. The Power Corporation holds about 85 per cent of the common stock of its main subsidiary. Some idea of the proportion of gross revenues that represent power and light enterprises may be had from the statement that in 1924 revenues from such sources totaled 83 per cent.

The Northern New York Utilities, Inc., has experienced a remarkable growth during the last decade, the electrical output having grown from 31,218,024 kw.-hr. in 1915 to 222,930,970 kw.-hr. in 1924. Gross earnings by persistent yearly increases rose in that period from $506,087 to $3,177,636, whereas net, also by yearly gains, rose from $298,102 to $1,709,651.

Net earnings have been sufficient in each of the last ten years to cover fixed charges by a comfortable margin, bond interest in 1924, for example, having been earned nearly three times. Indeed, after paying 7 per cent on the preferred shares, Northern New York Utilities, Inc., in 1924 showed 13.40 per cent on the common stock.

IMPORTANT LINK IN SUPERPOWER

The Power Corporation of New York constitutes an important link in the superpower system for this general part of the country in a group that includes the Niagara Falls Power Company, Niagara, Lockport & Ontario Power Company, Buffalo General Electric Company, Utica Gas & Electric Company, Adirondack Power & Light Company and New England Power System. The corporation's manual, speaking of this superpower development, says: "Over the transmission lines of these and other interconnected

companies it is now possible to send electric power as far west as Battle Creek, Mich., as far east as Boston and Providence and south into the state of Maryland. Upon the erection of a 30-mile transmission line connection could be established with the electric light and power companies of Greater New York."

The Power Corporation of New York system's undeveloped hydro-electric powers on the Raquette, Oswegatchie and Grass Rivers are recognized to be important high-head inland sites. The Raquette River has, for example, a drop that will permit of a development under a gross head of 510 ft. Altogether it has been estimated that "the annual electrical output will total more than a billion kilowatt-hours."

Issues Total $362,767,000 in First Quarter

The new public offerings of stocks, bonds and notes of electric light and power companies during the first quarter of 1925 amounts to $362,767,000, as compared with $200,803,700 in the corresponding period of the previous year. January ushered in the new year with a total of $83,400,000, February following with the substantial amount of $140,625,000, only to be outdone by March, when $143,942,000 was recorded.

Only fifteen utilities participated in the financing last month, the volume of the offerings being responsible for the huge total rather than the number. The largest single piece of financing was done by the Electric Power & Light Corporation, recently organized and discussed at length in the March 21 number of the ELECTRICAL WORLD, in the form of 7 per cent cumulative preferred stock. Long-term financing predominated, and the average yield advanced to 6.20 per cent.

Annual Reports of Light and Power Companies

The Philadelphia Electric Company shows in its annual report for 1924 operating revenue of $29,853,403, as compared with $27,609,189 for the previous year. The increase in operating expenses from $17,612,528 during 1923 to $19,212,489 during the past year was due entirely to increased volume of business. The new customers added to the system during the year 1924 amounted to 55,033, making the total number of customers upon the system December 31, 1924, 360,677. The total connected load of commercial, railroad, railway and other utilities increased to the equivalent of 2,138,960 50-watt lamps, making a total connected load for the system at the end of the year of 808,341 kw., or the equivalent of 16,166,820 50-watt lamps.

The Kansas City Power & Light Company for the year 1924 reported gross earnings of $9,498,740, as compared with $8,861,985 in 1923. Net income for the year amounted to $2,408,349 after deductions for interest, depreciation, taxes, etc. Expeditures for permanent improvements and additions to the plant amounted to $4,160,530. The meters in service at the end of the year were 109,451, as compared with 104,480 at the end of 1923.

The consolidated income account of the Potomac Edison Company for the year 1924 shows gross earnings from all sources of $3,621,845, as against $3,630,199 in 1923. There was a marked decrease in operating expenses from $1,977,419 in 1923 to $1,908,154 in 1924, this being due to the decline in fuel cost and to the ability of the company to transfer the bulk of its power load to the highly efficient Williamsport plant. Demand for electric service has continued to increase, the number of customers advancing from 29,022 in 1923 to 32,056 in 1924 and the output from 131,784,900 kw.-hr. in 1923 to 141,188,951 in 1924.

The Montana Power Company for the year ended December 31, 1924, reported a decrease of 1.6 per cent in the gross earnings under 1923—from $8,169,210 to $8,032,201. The decrease is due in part to the reduction in retail commercial and residence rates effective July 1, 1923. The total output in kilowatt-hours is substantially the same as last year, being 1,121,245,976 kw.-hr., as against 1,122,750,450 kw.-hr. in 1923. The connected load has increased 5,294 kw. to 406,400 kw., and the number of customers at the end of the year was 44,919, an increase of 1,559 over 1923.

Company Reports

Among the company reports issued during the past week for the month of February are the following:

Name of Company	Gross Revenues for February 1925	1924
Bangor Railway & Electric	$136,706	$135,244
Binghamton Lt., Heat & Pwr.	131,879	116,916
Blackstone Valley Gas & Elec.	421,096	406,051
Columbia Gas & Elec.	2,589,349	3,034,762
Columbus Electric & Power	215,220	202,046
Commonwealth Power	2,897,114	2,913,444
Consumers Power	1,721,969	1,693,660
Eastern Texas Electric	205,893	172,915
Edison Elec. Ill. of Brockton	150,378	147,521
El Paso Electric	203,849	201,210
Galveston-Houston Electric	303,318	266,735
Georgia Railway & Power	1,408,270	1,385,039
Great Western Power	648,974	632,467
Kansas City Power & Light	889,864	857,502
Lowell Electric Light*	163,000	160,000
Lowell Electric Light	142,841	142,488
Metropolitan Edison	696,621	688,143
Mississippi River Power	243,701	247,033
New Jersey Power & Light	100,478	93,532
North Carolina Public Service	153,770	126,423
Northern Texas Electric	197,666	222,639
Pennsylvania Edison	243,349	283,927
Philadelphia Company	5,625,279	5,670,898
Portland Electric Power	911,100	927,759
Public Serv. Co. of New Jersey	7,526,433	7,209,105
Republic Railway & Light	968,161	943,182
Savannah Electric & Power	157,845	158,882
Tennessee Electric Power	900,710	802,562
United Gas & Electric	1,183,540	1,175,147

* January

SECURITY ISSUES OF ELECTRIC SERVICE COMPANIES IN MARCH

Name of Company	Amount of Issue	Period, Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
American Power & Light Co. (N. Y.)	$8,000,000	91	Gold debenture bonds	Working capital and for other corporate purposes	6	95½	6.25
Arkansas Light & Power Co.	672,000	..	Preferred stock	Construction	7	96	7.30
Lake Superior District Power Co. (Wis.)	300,000	..	Cumulative preferred stock		7	96	7.29
Montreal Tramways Co.	7,000,000	30	General and refunding mortgage sinking-fund gold bonds, series A	Refunding	5	88	5.85
California Oregon Power Co.	2,006,000	30	First and refunding mortgage sinking-fund gold bonds	To retire underlying bonds and to reimburse the treasury for capital expenditures	5½	97½	5.67
Oklahoma Gas & Electric	23,500,000	25	First mortgage gold bonds	To retire entire outstanding funded debt of company and its subsidiaries	5	95	5.36
	8,000,000	15	Gold debentures	To retire funded debt of company and its subsidiaries	6	98½	6.15
Midland Utilities Co. (Del.)	12,000,000	..	Cumulative prior lien stock		7	98½	7.10
Wisconsin Public Service Corp.	500,000	33	First lien and refunding mor gage gold bonds, series B	To reimburse company for capital expenditures	5½	97	5.70
National Electric Power Co.	3,750,000	20	Secured gold bonds	To acquire stock of other utilities	6	97	6.25
National Public Service Corp. (N. J.)	6,000,000	30	Sinking-fund collateral trust gold bonds, series A	To retire outstanding obligations	6½	97½	6.70
	2,520,000	..	Class A, common stock	To complete merger and to provide money for expansion	..	21	....
Jersey Central Power & Light Co.	11,500,000	20	First mortgage and refunding sinking-fund gold bonds, series A	To finance merger and to retire outstanding obligations of the companies involved	5½	97½	5.70
Niagara, Lockport & Ontario Power Co.	15,000,000	30	First mortgage and refunding gold bonds	To retire outstanding bonds and to reimburse for expenditures for additions	5	98½	5.10
Electric Power & Light Corp. (Me.)	40,000,000	..	Cumulative preferred stock	Acquisition of assets and securities of other utilities	7	100	7
Cleveland Electric Illuminating Co.	2,000,000	..	Cumulative preferred stock	Construction	6	103.30	5.81+
American Public Service Co.	1,200,000	17	First lien gold bonds		6	100	6
	$143,942,000						

Stock and Bond Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stocks is $100.)

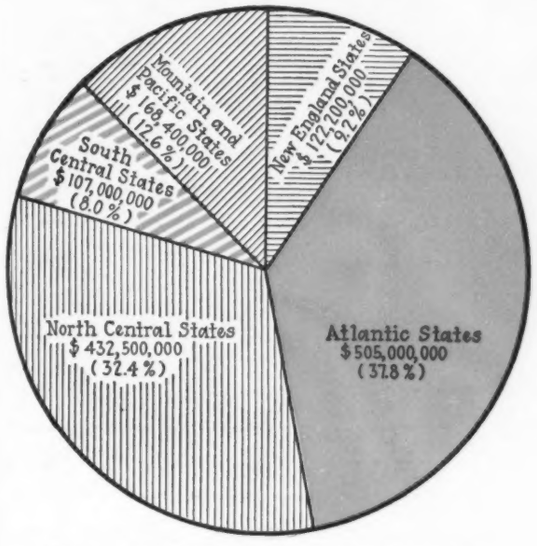
Companies	Bid Price Saturday, March 28	Low 1925	High 1925
PREFERRED STOCKS			
Operating Companies			
Adirondack Power & Light 7 per cent	100	98	102
Appalachian Power, 7 per cent	97½	92	100
Arkansas Light & Power 7 per cent	94	92	98
Asheville Power & Light 7 per cent	a 99	99	100
Central Illinois Public Service 6 per cent	87	84	92
Colorado Power 7 per cent	93	93	98
Connecticut Light & Power 7 per cent	105	105	110
Consumers' Power 6 per cent	91	90	93½
Dayton Power & Light 6 per cent	93	88	100
Duquesne Light 7 per cent	a107	105	107½
Eastern Texas Electric 6 per cent	100	100	105
Empire District Electric 6 per cent	78	78	85
Fort Worth Power & Light 7 per cent	a101	100	102
Great Western Power 7 per cent	98½	...	...
Illinois Northern Utilities 6 per cent	88	82	92
Illinois Power & Light 7 per cent	95	92½	98
Kansas Gas & Electric 7 per cent	a 98	98	100
Long Island Lighting 7 per cent	101	100	105
Minnesota Power & Light 7 per cent	a 96	96	98
Mississippi River Power 6 per cent	90	87½	92
Nebraska Power 7 per cent	a 98	98	100
Niagara Falls Power 7 per cent—25	28½	28	29
Niagara, Lockport & Ont. Power 7 per cent	105	101½	110
Northern States Power 7 per cent	97½	95	100
Ohio Public Service 7 per cent	97	97	100
Pacific Gas & Electric 6 per cent	95	92	97
Pacific Power & Light 7 per cent	a 98	98	100
Penn-Ohio Power & Light 7 per cent	93	91	100
Pennsylvania Power & Light $7—no par	a101	100	101½
Penn. Public Service 7 per cent	90	90	100
‡Philadelphia Electric 8 per cent—25	40½	38¾	45
Southern California Edison 8 per cent	118	115	122
Tennessee Electric Power, 6 per cent	82	80	84
Texas Power & Light 7 per cent	a100	100	101
Utah Power & Light 7 per cent	a 98	97	99
Western States Gas & Electric 7 per cent	82	82	85
Yadkin River Power, 7 per cent	a 99	98	100
Holding Companies			
American Gas & Electric 6 per cent—50	44½	44	47½
American Light & Traction	95	93	97
American Power & Light 6 per cent	87½	86	90
American Public Service 7 per cent	87	87	92
American Public Utilities 7 per cent	87	87	95
American Water Works & Electric 7 per cent	a101½	100	103
Associated Gas & Electric 7 per cent—1 per cent extra—no par	a 52	...	...
Carolina Power & Light 7 per cent	101	100	105
Central Indiana Power 7 per cent	89	88	95
Cities Service 6 per cent	81	80	83
Commonwealth Power 6 per cent	80½	80	82½
Consolidated Gas 6 per cent—50	57½	57½	58½
Continental Gas & Electric 7 per cent pr. pf.	91	89	95
Electric Bond & Share 6 per cent	102½	102	104
General Gas & Electric—$8—no par	109	104½	111
*Middle West Utilities 7 per cent	96½	91½	98½
National Power & Light—$7—no par	96	95	99
North American 6 per cent—50	48½	46½	49
Public Service Corp. of N. J. 7 per cent	99	99	102
Public Service Corp. of N. J. 8 per cent	110½	109½	112½
Standard Gas & Electric 8 per cent—50	50	49	52
‡United Gas Improvement—50	57½	56½	58½
United Light & Power—$6.50—no par	84	83	88
COMMON STOCKS			
Operating Companies			
Adirondack Power & Light—50	39	31	42
Appalachian Power—no par	76	70	83
Arkansas Light & Power	75	65	85
Brooklyn Edison	128½	120½	133
Buffalo General Electric	247	197	250
Colorado Power	a 33	...	...
*Commonwealth Edison	138½	134½	139
§Consolidated Gas, Electric Light & Power	35	32	35½
Dayton Power & Light	420	180	460
Detroit Edison	114	110	119
|| Edison Electric Illuminating of Boston	200	200	206
Kentucky Hydro-Electric	92½	85¾	92½
Long Island Lighting	65	60	85
Mississippi River Power	40	37	42
Montana Power	a 65	64½	72
Niagara Falls Power—no par	50	45¼	58
Niagara, Lockport & Ontario Power—no par	63	63	73
Northern Ohio Power	6½	5	7½
Northern States Power	107	103	110
North Texas Electric	60	60	70
Pacific Gas & Electric	a105	102½	108½
‡Penn Central Light & Power—no par	64	60	64½
§Pennsylvania Water & Power	130½	126½	133½
‡Philadelphia Electric—25	41	38¾	45¾
Public Service Co. of Northern Illinois	114	97	116
Puget Sound Power & Light	50	50	58
Southern California Edison	103	102	106
Tennessee Electric Power—no par	53	47	61
Virginia Power	65	65	92
Virginia Railway & Power	a 76½	64½	86½
West Penn. Co.	a109¼	105	120

Companies	Bid Price Saturday, March 28	Low 1925	High 1925
Holding Companies			
American Gas & Electric—no par	70	70	80
American Light & Traction	145	139	153
American Power & Light	53½	53	67
American Public Utilities	70	70	85
American Water Works & Electric	a 46½	34¾	49
Associated Gas & Electric, Class A	a 26½	...	...
Carolina Power & Light—no par	335	290	340
Cities Service	185	172	210
Columbia Gas & Electric—no par	a 54¾	45¾	59
Commonwealth Power Corp.—no par	108	106	126
Consolidated Gas—no par	a 75½	74¼	78¾
Continental Gas & Electric	83	80	90
Electric Power & Light	a 14	13¾	15
Federal Light and Traction	139	114½	148½
General Gas & Electric	80	72	82
Lehigh Power Securities—no par	93	82	116
*Middle West Utilities—no par	92½	82½	102½
National Power & Light—no par	217	185	230
North American—10	a 45	41½	49
Philadelphia Co.—50	a 52½	51½	57½
Power Securities—no par	16	...	...
Public Service Corp. of N. J.—no par	a 65½	62¾	72¾
Standard Gas & Electric—no par	a 43½	40½	47¾
United Gas & Electric (Conn.)—no par	30	26	37½
Utah Securities	a 65½	41½	69½
BONDS			
Operating Companies			
Adirondack Power & Light 6s	1950	104½	102½ 105
Alabama Power 5s	1946	97½	96 98
Appalachian Power 5s	1941	97	96 97½
Brooklyn Edison 5s	1949	100	99½ 100½
Cleveland Electric Illuminating 6s	1930	104½	104½ 105
Commonwealth Edison 5s	1939	100½	100 101½
5s	1943	100½	99½ 101
5s	1953	99	98½ 99½
Consol. Gas, Elec. Lt. & Pwr. 4½s	1935	93½	93½ 97½
§6s	1949	106½	104½ 106½
Consumers' Power 5s	1936	99	99 99½
5s	1952	94½	90½ 95½
Detroit Edison 5s	1933	101	99½ 102½
Duquesne Light 6s	1949	105½	104½ 107
Great Western Power 5s	1946	97	95 97½
Kansas City Power & Light 5s	1952	97½	95½ 98½
Mississippi River Power 5s	1951	98	96½ 99
Montana Power 5s	1943	99	97½ 99½
New England Power 5s	1951	100½	100½ 101½
New York Edison 6½s	1941	112½	112 115
Niagara Falls Power 5s	1932	101½	100½ 102½
Northern States Power 5s	1941	95⅝	93 96½
6s	1941	96	96 107½
Ohio Power 7s	1951	106½	106½ 107½
Pacific Gas & Electric 5s	1942	94½	93½ 96
Pennsylvania Water & Power 5s	1940	100	99½ 101
‡Philadelphia Electric 5s	1966	100⅜	100½ 102
5½s	1947	105	103½ 105
6s	1941	107½	106 107½
Portland Electric Power 6s	1947	96½	94 99½
Southern California Edison 5s	1939	99	99 100½
6s	1944	103½	102½ 104½
Tennessee Electric Power 6s	1947	101½	99½ 102½
Texas Power & Light 5s	1937	96½	96½ 98
Toledo Edison 7s	1941	109¾	108½ 110
Utah Power & Light 5s	1944	94½	91 95½
Holding Companies			
Alabama Traction, Light & Power 5s	1962	87½	86 87½
American Gas & Electric 6s	2014	96½	96½ 97
American Power & Light 6s	2016	95	94 95½
Amer. Water Works & Electric 5s	1934	95½	92½ 96½
Associated Gas & Electric 6½s	1954	a100	... ...
Central Indiana Power 6s	1947	97½	95½ 98½
Commonwealth Power 6s	1947	100	97⅝ 101
Consolidated Cities Lt., Pwr. & Tr. 5s	1962	79¼	75½ 80½
Illinois Power & Light 6s	1953	101	100½ 102
United Light & Railways 5s	1932	95	93½ 95
6s	1952	98	95¾ 99½
ELECTRICAL MANUFACTURING COMPANIES			
PREFERRED STOCKS			
Allis-Chalmers Manufacturing	103	103	107
Worthington Pump & Machinery B	a 81	81	88
COMMON STOCKS			
Allis-Chalmers Manufacturing	a 79	71½	86½
American Bosch Magneto—no par	a 29	26½	54½
Electric Storage Battery—no par	a 61⅜	60½	70½
General Electric	a263½	227½	320
General Electric—10	a 11¾	11	11½
*Hurley Machine—no par	44½	41⅜	56
†Wagner Electric	32	26½	50
Westinghouse Electric & Manufacturing—50	a 67	66½	84
Worthington Pump & Machinery	a 48⅜	45	79½
BONDS			
Canadian General Electric 6s	1942	107⅜	107⅜ 107½
General Electric 3½s	1942	81½	81½ 84
5s	1952	103	101½ 105½
Robbins & Myers 7s	1952	66	66 73½
Wagner Electric Mfg. 7s	1931	101½	100½ 101½
Western Electric 5s	1944	99	98 99½
Westinghouse Electric & Mfg. 7s	1931	107½	107½ 108½

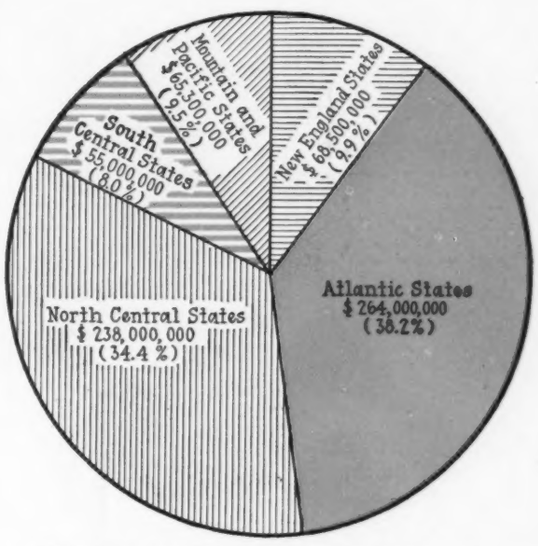
*Chicago Stock Exchange. †St. Louis Stock Exchange. ‡Philadelphia Stock Exchange. || Boston Stock Exchange. § Baltimore Stock Exchange.
a Bid price, low and high, Tuesday, March 31.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business



GROSS REVENUE FROM SALE OF ENERGY — 1924
$ 1,335,100,000



OPERATING AND MAINTENANCE EXPENSES — 1924
$ 690,800,000

The Relation of Revenue to Investment

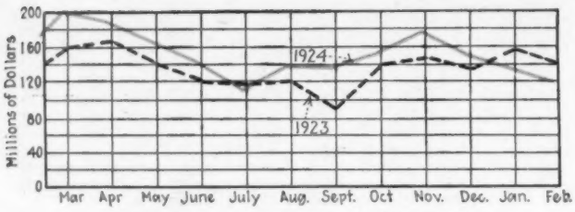
FINANCIALLY the electric light and power industry occupies a unique position in that it has never reported a decrease in its annual gross revenue. Other industries may "dig in" until the storm has passed, but the electric light and power industry keeps steadily on to greater and greater heights of achievement.

In the relationship between the revenue of the industry and the investment therein is to be found another unique situation. The relation between revenue and investment is very generally known in the ordinary retail business, and the average man does not hesitate to think that the same relationship is true of the electric light and power business. The public fails to grasp the fact that the average central-station company must invest approximately four dollars for every dollar of gross revenue received. In virtually every other line of business the volume of business done is greatly in excess of the investment. A grocer with an investment of five thousand dollars very naturally and very properly expects to do at least six times that volume of business. To a proper understanding of the public utility industry it is necessary to understand the disparity between the volume of business done and the investment of the public utility companies compared with other normal merchandising and manufacturing enterprises. That the public may arrive at such an understanding is one of the outstanding tasks of the electric light and power industry.

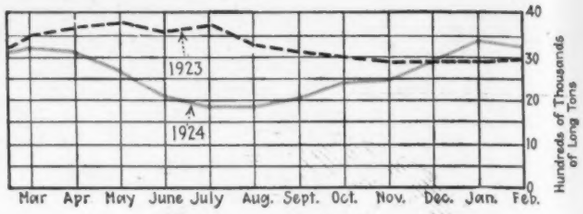
Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote for use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.

How the Primary Industries Are Trending

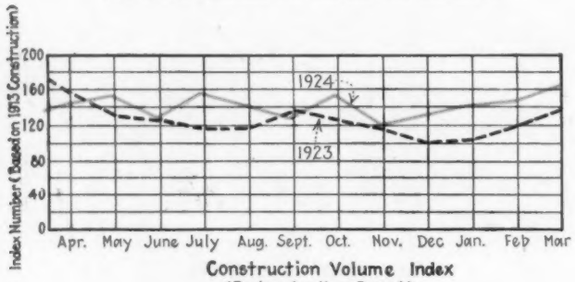
All data except that on "Volume of Construction" and "Construction Cost" are supplied monthly by the Bureau of the Census. Similar data on other industries may be obtained from the "Survey of Current Business," Bureau of the Census, Washington, D. C.



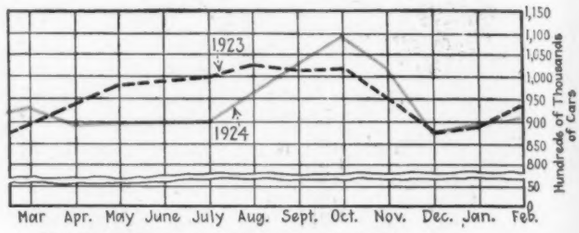
Contracts Awarded for Residential Buildings



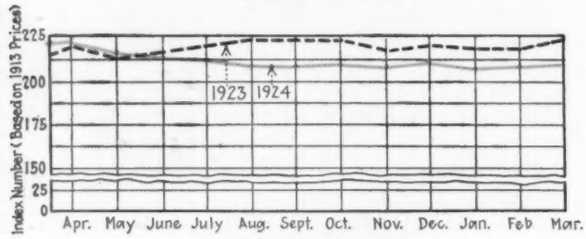
Pig-Iron Production



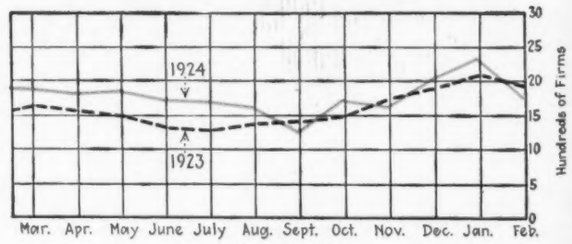
Construction Volume Index
(Engineering-News Record)



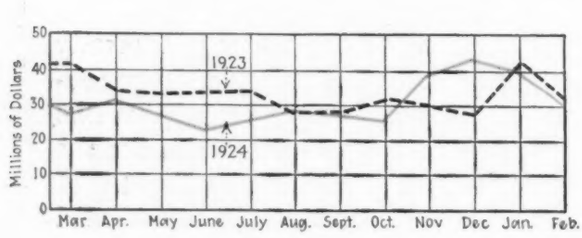
Total Average Weekly Freight-Car Loadings



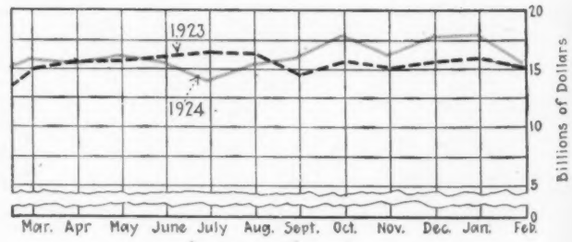
Construction Cost Index
(Engineering-News Record)



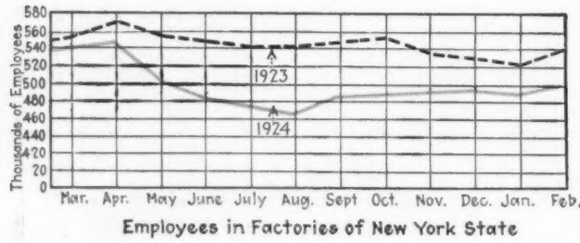
Business Failures



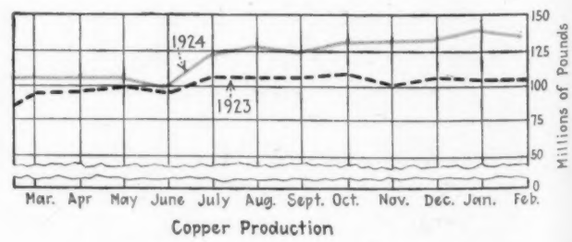
Fire Losses



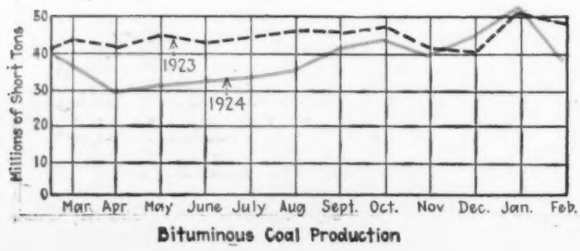
Bank Clearings
(Outside of New York City)



Employees in Factories of New York State



Copper Production



Bituminous Coal Production

Business Continues to Improve

GENERAL business continued to improve during February. Iron and steel production was at a higher rate and car loadings were in greater volume than even in January, 1925, or February, 1924. While probably no industry was operating at full capacity, yet activity was in general close to the estimated normal for the month.